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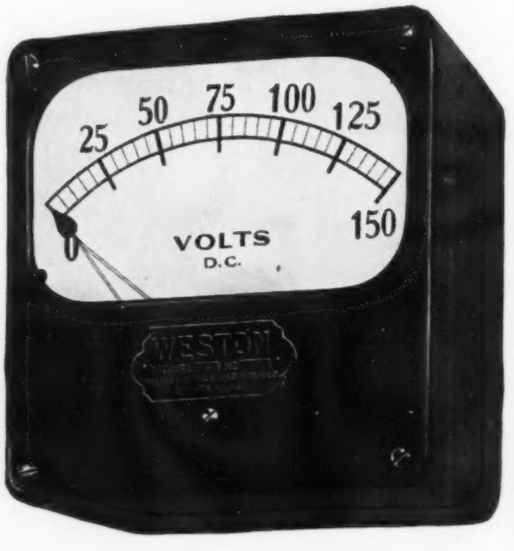

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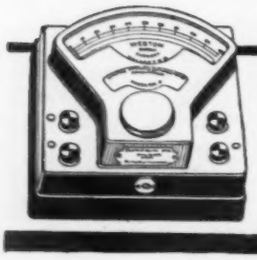

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Electrical World

THE CONSOLIDATION OF ELECTRICAL WORLD, ELECTRICAL ENGINEER AND AMERICAN ELECTRICIAN

Published by McGraw-Hill Company, Inc.

W. H. ONKEN, JR.

Editor

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Progressiveness of the West

NATURALLY, since this year's convention of the National Electric Light Association is to be held at San Francisco, the eyes of the industry are focused on the Pacific Coast. Western life and civilization with all their romance and adventure have a gripping appeal on American hearts. The West also enthralls and entrances the eye, for the coast region, with snow-capped Whitney and Rainier as sentinels at either end and majestic Shasta between, abounds with natural resources of inestimable value and scenic beauty of surpassing grandeur. There still hovers the spirit of the pioneer, and there examples of the handiwork of daring and intrepid engineers are to be found on every side. Bigness characterizes everything along the Pacific Coast and progressiveness is its outstanding feature.

To men engaged in the electrical profession, and particularly those specializing in public utility work, the West is an inspiration. It matters not whether a man be an executive, an engineer or an operator there is no other place where electricity is applied in a more intensive and spectacular way and where administrative and engineering problems are more diverse or better solved. Water power is more abundant on the Pacific than on the Atlantic Coast, but it is also remoter from civilization. Hence the almost exclusive use of hydro-electric stations and the predominance of long-distance transmission. On the Pacific slope the distances between stations and cities are very great and the voltages high. California holds the record with transmission lines operating at 220,000 volts.

The vigor and youth of the West are possibly best shown in the part it has played in the great movements which have taken place and are still uppermost in electric light and power circles. Superpower was practiced on the Pacific Coast long before the word was coined. Interconnection likewise has been in vogue for years, lines stretching almost unbrokenly from Montana to the Pacific and from British Columbia southward through Washington, Oregon and California into Mexico. Conservation is a Western word, and it was to meet the conditions on the Pacific slope that the federal water-power act was primarily drawn. Customer ownership originated with the Pacific Gas & Electric Company, and the most prominent exponent of better public relations is the Southern California Edison Company. The Northwest furnishes one of the finest examples in existence of trunk-line railroad electrification, and electrified farms are found on all sides. In fact, greater use is made of electricity on the farms of California and the rates are lower than anywhere else in this country. The West has already found the answer to the problem of rural electrification.

Thus the West means much to the electric light and power industry. The problems of the Pacific, to be sure, are not those of the Atlantic, and neither can be substituted for the other. But the former is as progressive as the latter is conservative, and it is the happy blending of the two that has made the United States great electrically. The National Electric Light Association in convention at San Francisco will take up problems of vital interest to all sections of the country. It is essential to their proper solution that the East know the West and the North the South, that the steam-station operator in thickly populated industrial centers appreciate the trials of the water-power operator in sparsely settled sections, and that the experiences of all be pooled for the common good. Modernity and enthusiasm are more plentiful in younger civilizations, for they are the residuary legatees of all that has gone before. The Far West possesses them in abundance; that is what makes irresistible the attraction of the Pacific Coast.

Trade Bodies and Anti-Trust Laws

THE Supreme Court has spoken in a far-reaching decision of great importance to the business world. It held on June 1 that trade associations do not violate the anti-trust laws in gathering and disseminating among their members information as to costs of production, volume of production, the actual price which the product has brought in past transactions, stocks on hand and other statistical details that enable members to conduct their business intelligently. Provided that this information is openly and fairly gathered and discussed without any attempt to reach agreements, fix prices or restrain competition, trade associations need not fear the anti-trust laws.

Justice Stone in handing down the decision said clearly: "It is not open to question that the dissemination of pertinent information concerning any trade or business tends to stabilize that trade or business and to produce uniformity of price and trade practice. . . . But the natural effect of the acquisition of wider and more scientific knowledge of business conditions on the minds of the individuals engaged in commerce and its consequent effect in stabilizing production and price can hardly be called a restraint of commerce, or, if so, it cannot, we think, be said to be an unreasonable restraint or in any respect unlawful."

Thus those trade associations whose intent is within the law now have an opportunity to benefit their membership in ways heretofore denied. This decision and the traffic policeman's attitude of the Federal Trade Commission combine to encourage a greater efficiency and stabilization of business than has hitherto been possible. American business can now conduct its affairs intelligently.

Promising Outlook in Electrical Industry

A SURVEY of the electric light and power industry at this time shows that conditions are very promising from every aspect. New capital issues floated during the first five months of this year aggregate $501,448,000, an excess of $150,928,300 over the same period last year. This vast sum was raised under especially good conditions and rates and is being spent in expanding utility service facilities.

A survey of stations under construction or going into operation this year shows a grand total of 3,020,800 kw. in seventy-three plants. Thirty-five of these stations are hydro-electric, aggregating 1,215,905 kw., and thirty-eight are fuel-burning plants, aggregating 1,804,895 kw. The total ultimate rating of these stations is 8,432,000 kw., or more than one-third the present generating capacity installed in the industry. In transmission and distribution facilities the industry is spending more than $375,000,000 this year, which represents a big increase over previous expenditures for these divisions of the industry. It speaks well for public relations and credit conditions that the utility companies have sold their securities directly to customers to the value of $148,500,000 during the first five months of this year. The total of this type of sale amounted to only $194,200,000 in 1924, and the 1925 record indicates an amount far in excess of this sum. These enormous sums represent the expenditures necessary to meet the demand for electric service. Statistics for the first quarter indicate an output of fifty-eight billion kilowatt-hours of energy during 1925 and a gross revenue from energy sales of $1,470,000,000. These large increases over previous years indicate the prosperity of the industry.

Ever alert to give better and more economical service, the electric light and power industry has taken many forward steps this year in generation, transmission and distribution. The most efficient generating stations in the world are now in operation in America, and the great interconnections and consolidations have enabled many operating and construction economies to be made. Intelligent leadership continues to deserve the confidence of those using electric service in this country.

Raising Limits in Transmission

GOOD reports are heard of the present status of the art of transmission in this country. Years of development have brought about good insulators, good towers, good conductors and good accessory equipment, and a knowledge of the limits of performance of existing transmission equipment is available which permits installations to be made with confidence. But engineers are never satisfied with their accomplishments and the demands of the industry continue to increase. Thus an analysis of large-capacity lines of very high voltage shows the desirability for changing existing practice and raising limits on transmission equipment, as well as for insuring greater control and reliability in the operation of the lines.

Such lines as are proposed—for example, a "super-transmission" system supplying a 132,000-volt network or a diversity interconnection between large metropolitan centers—present new economic and engineering problems. Economic reasons dictate the use of long spans, few insulator units per conductor and tangent construction. Conductors of large diameters are required to carry the energy and reduce corona losses, and the requirements for mechanical strength as well as vibrational effects causing metal fatigue introduce vital physical elements that must govern the selection of conductors. In many localities sleet is encountered, and in all cases great operating reliability is desirable. Tangent lines are desirable since dead-end structures have proved less reliable, and if curves or turns are required, many engineers advocate the use of individual-phase towers. It is also thought desirable to put some form of relief valve on insulator strings to reduce insulator punctures in the event of flash-overs, and an increase in the strength limits of insulators would bring economies in construction.

It is necessary to make the mechanical structure sound and strong, and the greatest remedy for electrical troubles lies in increasing the clearances and perfecting the relaying. This means increased investments in lines, but no short cuts can be tolerated in the building of reliable lines for the grade of service required on these superpower and supervoltage lines.

Other major problems are associated with control of voltage and flow of power on these lines. They are single-track systems which should carry traffic in either direction at the will of the dispatcher. There is much to be done in the economic and engineering development and use of tap-changing transformers and synchronous

condensers before this traffic problem is solved satisfactorily.

The problem of switching and relaying remains unsolved to the greatest degree of any encountered on existing systems and is truly formidable for the proposed systems operating at very high voltage and carrying an immense amount of energy. Oil breakers, high-voltage fuses, air-break switches and the many types of relays must be developed to a degree difficult to conceive if a full realization of reliable service is to be had, especially in times of system trouble.

All these new developments in the art of transmission are dictated by the growth of the industry and the desirability of increasing the economy and reliability of service on these "supertransmission" systems. Many of the problems are unsolved, and yet past history shows that engineers and manufacturers will rise to the occasion and obtain the desired results through co-operative work. A new art of transmission is rapidly coming into existence to meet new economic and operating necessities.

Multiplicity in Standardization

THE electrical industry now has both organization standards and American standards. At least eight groups in the industry are engaged in standardization work, and the A. E. S. C. procedure has produced several American standards. This is a valuable and logical status for electrical standardization to attain under present conditions. It recognizes and takes advantage of time elements, the needs of the industry in its various branches and as a whole, the many constructive aspects from which standardization may be approached. All standards are valuable, and those already made have been of incalculable benefit.

An organization standard is usually produced quickly, in response to a definite need in one branch of the industry and by those most competent to fix the standard with respect to its most vital elements. An American standard, however, should be the result of co-operative thought, leisurely and careful preparation and seasoned experience on an industry-wide basis. Seldom if ever should a new organization standard be accepted immediately as an American standard, for it often means a standard of expediency instead of permanency.

While the electrical industry continues in each branch to expand in many directions most standards will be temporary expedients to attain an economic working status whereby progress can be accelerated. This type of standard must be made quickly and applied quickly to be of value, and it accents only the items needed to serve the given conditions in that branch of the industry. Here the organization can do its best work, for its standardization procedure is simple, rapid and most responsive to the essential requirements for the standard. Inevitably this type of standard is incomplete, reflecting only certain views, and it should seldom be adopted verbatim as an American standard. But those organization standards which have proved valuable in their practical application over a period of time would seem most promising for development as American standards. Their value will be increased by the co-operative action of all branches of the industry, and the delay inevitable in a more complicated procedure works little harm.

This kind of thinking would seem to promise more restricted and yet more rapid organization standardization and more mature and thorough American standardization. It also promises to eliminate conflicts over jurisdiction between organizations. What the industry needs is more standardization and not more arguments on procedure and jurisdiction brought about by the complexity of the present procedure for making electrical standards.

Merchandising Profits Are Important

CENTRAL-STATION executive thinking continues to differ radically regarding the need of making a profit in merchandising electrical appliances when the matter is discussed freely in various localities. One school of opinion considers the load value of appliances sufficient reward for their sale even at a deficit; the other affirms that departmental operations should be self-supporting regardless of revenue from use. In addition, there is a widespread and regrettable lack of executive interest in merchandising because of the small percentage of company income this business represents, and this lack is to no little degree responsible for the confusion and uncertainty now evident in this branch.

There are many unsolved problems in electrical merchandising. If this were not true, a well-edited periodical devoted to that specialty could not succeed. With merchandising methods the ELECTRICAL WORLD is less concerned than its affiliated brother of the press; but economic policies challenge the attention of central-station men, jobbers and manufacturers everywhere. This question of profit in the appliance department will not down. It is the privilege of every central-station management to run such a department at a loss if it so wills, but we believe it is a serious mistake to do this.

Fair competition specifies the selling of appliances at prices that yield a reasonable profit under sound business methods. A reasonable profit may mean quite a different percentage above cost in the case of a staple socket device and in that of a heavier-duty electrical convenience requiring a substantial investment on the part of the customer and of the company to obtain service. There must be some elasticity in meeting installation conditions and costs. Too often other branches of the industry criticise the central stations and their merchandising practices because of insufficient knowledge of conditions; but, on the other hand, utilities which resort to price cutting without justification naturally attract the lightning of adverse comment. One cause of much misunderstanding is the absence of accurate knowledge of merchandising costs throughout the industry, but this situation will not be allowed to continue indefinitely. Already steps are being taken to overcome the difficulty, and great improvement in the next three to five years may be confidently looked for.

Dollars lost in unprofitable merchandising are not excusable because their total may be relatively small. Good public and good industry relations demand a sound economic administration. The load value of appliances may far transcend all other measurements of business worth in this department, but in the interests of an economical conduct of affairs and stable industry relations merchandising profits are important and should be sought with might and main.

FRANKLIN T. GRIFFITH

President National Electric Light Association

UNDER the able leadership of Franklin T. Griffith the National Electric Light Association has reached new heights of accomplishment during the past year. His executive ability, utility experience and splendid personality have been given unstintedly to advance the light and power industry. The convention at San Francisco will record the many achievements of his administration and afford testimony of the able leadership he has given. The thanks of the industry are due Mr. Griffith for his devoted service in its behalf.

Achievements—Past and Future

Economy in Production, Growth of Interconnection and Partnership with Customers Are Sources of Just Pride—Extension of Rural Service and Conversion of Those Who Still Clamor for Public Ownership Are Still Tasks in Hand

By Franklin T. Griffith

President of the National Electric Light Association
and of the Portland Electric Power Company

THE continuous growth of the electric light and power industry is, of course, phenomenal, but not more so than the increasing efficiency with which electricity is being generated and transmitted. Mass production and greater co-ordination of facilities have resulted in marked savings, and for these the industry is indebted to its engineers. A few years ago the manufacturer of a kilowatt-hour of electrical energy in a steam station required the combustion of two pounds of coal, whereas today a kilowatt-hour can be produced in the most modern stations on half that amount. The significance of this and its relationship to coal conservation are enormous.

Hydro-electric practice shows a slight gain, although the over-all efficiency of water-power stations has been remarkably high for the past decade and leaves little room for improvement. Individual hydraulic units, it is interesting to note, have grown in hugeness, surpassing the single-cylinder steam turbine in rating and making for greater economy of production.

SUPERPOWER

In no direction has greater progress been made, however, than in the interconnection of systems into regional power zones and in the extraordinary expansion of electric service. Electricity is being consumed in greater and greater amounts, and it is a pleasure to observe that with this increase in consumption there is apparent a keener appreciation of electric service on the part of the public and that investors have shown greater confidence in the stability of the earning power of the utilities.

To be sure, the industry has worked hard to merit this appreciation and has in view still further economies in production, a greater expansion of service and a wider diversity of ownership. As a result, it naturally expects in the immediate future to obtain money at somewhat lower rates than those which now obtain and thus be enabled to expound its services to remoter parts and to hasten the time when farms, homes and all industry will be more or less completely electrified.

REGULATION

Side by side with this record of achievement is the broader and more constructive attitude manifested on the part of public service commissions toward the electric utilities. Naturally, with the industry bending all its efforts to give the utmost of service at the minimum cost, and particularly with a commodity so universally applicable and satisfactory as electricity, the attitude of the public toward the electric light and power companies is in the main friendly, so that the commissions receive few complaints about electric service. The industry, of course, accepted regulation from the outset, has acquiesced in most of the commission rulings and has done everything to make regulation effective. It is but natural, therefore, that its relations with the public service commissions should be harmonious and that appeals to the federal courts from commission decisions should be very few in number. Strife and litigation are not conducive to progress. The industry asks for no more than it is entitled to, accepts the doctrine of a fair return on honest investment, but hopes for some recognition in the shape of a reward for efficiency, when such a reward is merited.

CUSTOMER OWNERSHIP

Among the many constructive and far-sighted policies adopted by the electric light and power companies of the country none has given greater satisfaction or been more effective in improving public relations than the customer-ownership movement which the industry initiated. The practice of selling preferred stock to employees and customers is still followed, and there is every indication that a considerable portion of new money will be raised yearly through the sale of junior securities of undoubted integrity directly by the companies to their patrons.

ELECTRICITY ON THE FARM

Aside from the progress made in interconnection the greatest recent movement undertaken by the industry of social importance to the nation is that looking toward the ultimate and complete electrification of the farms. In co-operation with agricultural colleges, farm bureaus, manufacturers, and with government departments, the National Electric Light Association is gradually evolving a plan whereby electricity can be made available to most of the farms of the country with maximum advantage to the farmer.

All things considered, it is unlikely that electric light and power companies will find rural and farm loads very profitable. Farmers themselves, while admitting the desirability of electricity for lighting in general household use, are not altogether convinced that the electrification of all farm machinery will be

advantageous to them. They recognize, however, the necessity of co-operation on their part if anything applicable and acceptable is to be forthcoming and are glad that the industry is approaching the subject in a sensible way and really making an effort to serve them if it is at all possible.

There are millions of farms in the United States, and the industry recognizes that the men who own them and work them form the backbone of our social and national progress. The country's prosperity depends on the prosperity of the farmer, and we of the electrical industry not unselfishly reason that if we ease the drudgery and labor of farm life we pave the way for more productive effort on the part of the farmer and greater contentment and prosperity will follow as a matter of course. Such a social asset is worth striving for and offers a greater compensation than the mere return received from the kilowatt-hours of electricity sold.

PHENOMENAL GROWTH OF INDUSTRY

We must not forget that the industry we represent is the most rapidly growing one in the world, and if it is to be kept in the forefront we must busy ourselves through research or other means in finding new uses and applications for electricity. Thus far we have given a good account of our stewardship. Our electric light and power companies are recognized as among the most efficient and progressive in existence.

This record has been achieved under the driving power of private initiative and enterprise. Ninety-six per cent of all the electrical energy used in the United States is generated in plants privately owned, but notwithstanding the success that has attended the efforts of the men of the industry in demonstrating the merits of private ownership and operation, there is in some sections of the country a growing but misguided sentiment for state ownership.

The attack is by that class of people who formerly advocated political ownership of the railroads. There is not so much talk nowadays of municipal ownership and operation of electric utilities because municipal ownership is no longer economical. But there are radicals who have gone so far as to suggest federal operation of the electric utilities.

SUCCESS BRINGS ENVY

Theorists, possessing only a superficial knowledge of development problems and with little or no practical information concerning the operation of our electric utilities, are urging that because of the size and importance of our industry it should be directly owned and controlled by the national government.

The trouble is that we have been skillful and resourceful enough to grapple with intricate difficulties and overcome them. We have grown in size and in efficiency and even with restrictive legislation have attained a certain measure of success, and it is this very success, won with so much effort, that gives rise to envious clamor.

Last year more than one billion dollars was invested in additional facilities to provide electric service. The best proof that we have been good administrators is the fact that we have been able to secure the funds necessary for the phenomenal expansion of our business. Our extraordinary growth has been a notable feature of the country's industrial progress. So far this year we have forged ahead at a still more rapid pace and the very general success of our enterprises has been reflected in the increasing popularity of public utility securities.

ASPIRATION OF THE DEMAGOGUE

It is in this direction that danger lies. The demagogue cannot afford to associate himself with losing ventures. His political future is jeopardized unless he links himself with something popular and successful. The increasing popularity of electric public utilities, the broadening appreciation by the consumer of the value of the service and the marked efficiency with which the business is conducted have impressed him greatly.

While the demagogue recognizes the effect of private initiative and enterprise in the electric light and power business, he denies the potency of the cause. Superpower appeals to his imagination and gives the electric light and power industry a dramatic setting. The technique of long-distance transmission and the economies secured through interconnection are, of course, unknown to him. He concerns himself only with the fact that the industry is popular and that the people of the community are investing their money in its securities.

Increasing vigilance will therefore be necessary on the part of the electric light and power industry to meet the attacks directed against it by political agitators. The present development is a magnificent tribute to the skill, zeal and enterprise of the industry and to American institutions, which offer such incentives to the individual.

However, it is expedient that the public be informed of our accomplishments. It is not sufficient that the business is conducted efficiently and economically. The people must know that this is so. Prejudice and ignorance are the qualities on which the demagogue thrives, and when the public is informed, his occupation is gone.

KEEP THE PUBLIC INFORMED

The various bureaus on public utility information have done admirable work. It is not to be expected, however, that they can perform miracles or that they can atone for the shortcomings of any electric public utility company or of inconsiderate and incompetent employees. The leaven of honest service must permeate the entire industry before proper public relations can be obtained. Americans will not have recourse to government ownership so long as private ownership provides them with good service at low rates. The industry as it is now conducted has commended itself to a majority of the people of this country, but we must not rest on laurels already won.

There is yet considerable work to be done before electric service becomes universal throughout the United States, and the public has a right to expect us to do the work and to do it well. That we can do it is generally conceded, but the task will be easier and its accomplishment will be a great deal quicker if the program meets with hearty co-operation all along the line.

Business and Government

Should Be a Continuous and Public-Spirited Alliance—Modern Problems Are the Problems of the Ages—Tendency to Over-Regulation and Over-Legislation

By Wigginton E. Creed
President Pacific Gas & Electric Company
San Francisco, Cal.

WE ARE constantly reminded that we are not succeeding as well as we should in sustaining the right relation between government and business. It is important to every one that we preserve a continuous and public-spirited alliance and avoid the costly oscillation from alliance to war and back again. Government profoundly affects our economic structure for good or evil, and business touches life at so many points that business must be a matter of universal concern, not only because its condition affects our material prosperity but also because it is a dynamic force behind social progress.

In meeting the problems involved, there is an unwarranted tendency to say they are new. We hear that we live in an age when man flies from coast to coast between the rising and setting of one sun; when the radio throws its message across the seas and mountains unrestrained by time and space; when wonders of electricity can lessen human toil and effort; when man is the master instead of the servant of nature; when the world is so compressed and interrelated and the changes in social and economic conditions so far-reaching that old creeds no longer suffice and tried principles are outworn.

WIGGINTON E. CREED

The president of the Pacific Gas & Electric Company is the executive leader of an organization that is building a chain of five power houses on Pit River in northern California. This development of upward of 600,000 hp. furnishes energy to San Francisco and other Bay cities over long 220,000-volt transmission lines and represents one of the greatest power projects in the world. Mr. Creed is a firm believer in the fundamental theory that the American nation is founded on the rights and duties of the individual, with government a necessary provision for safeguarding the common interests. He believes that real progress comes about through the private operation of business and has led his organization to new heights of attainment in the practical application of this belief. He is a splendid type of modern utility executive.

This point of view is quite misleading. The main distinctions between our civilization and earlier civilizations are due to scientific achievement. The discoveries of science have filled the world's storehouse of knowledge and solved countless mysteries that awed or baffled the ancients or held them in bondage. Our problems are new only in the sense that we must deal with more facts, with man's greater control and mastery and understanding of the forces of nature and with his greater use of these forces; but in essence and in kind our so-called modern problems are the problems of the ages. They involve the play of human spirit, the fine hopes, aspirations and ideals as well as the baser instincts of mankind. We confront today the same inherent qualities, the same temptations, the same potentialities and the same limitations of human nature that existed when Alexander the Great consolidated his realms. Just as there is a continuity in art, literature and law, just so is there a continuity in our social and economic problems.

Outside of science, there isn't much that is wholly new. The struggle of business for a proper relation with government is just about as old as the struggle for liberty under law. Long before our time, others fought to obtain economic freedom; our duty is to see that we retain it.

Peering back into the long record of human achievement and failure before the establishment of the American government, we can see an instructive and fairly accurate picture of government extravagance without limit; of growing exactions upon business in the form of burdensome taxation; of wealth created by agriculture, trade and industry withdrawn from productive avenues; of great portions of populations turned from industry to recruit vast armies of governmental officials; of industry stifled by government competition and the creation of royal monopolies; of great hordes of government tax-gatherers and regulators bringing added exactions and interference until business was no longer able to meet fully the needs of society.

This picture the founders of the country saw clearly, and they understood its significance. They knew that under these policies opportunity was denied, enterprise deadened, and the wealth coming from agriculture, trade and industry dissipated and prevented from creating a decent standard of living.

One thing more they understood—that it is inherent in the psychology of man that economic progress will be made only when opportunities for initiative are afforded to him, indeed when initiative is demanded of him, and when he is allowed to reap and retain the fruits of his enterprise; they knew that if he were either coddled by a paternalistic government, or unduly circumscribed in his endeavors by regulations and exactions of unrestrained rulers, his ambition would be neutralized and the great incentive to progress removed. So they stood four-square for a government of law that would maintain "an open road for every one," promote the free play of enterprise, and turn the benefits of economic progress to social advancement.

The result of their understanding of the value of historical records and their own direct relation to them has been the creation in America of the greatest and most serviceable economic structure, the highest standard of living and the widest distribution of wealth known to the world. No parallel has ever existed, or exists anywhere else today.

Notwithstanding this record of accomplishment, which has meant so much to the comfort and security of American citizens, we now face unmistakable tendencies that are gradually taking government out of its place and creating conditions at war with the maintenance of a sound relation between government and business. Our chief indictment must be directed at the tendency to over-regulation and over-legislation. It continues uncurbed, either because its cumulative effect is not understood or because of the indifference of intelligent people to public affairs. Literally, the country has gone "law crazy." Thousands upon thousands of new laws affecting business have been passed in the last few years, and continue to be turned out annually by the thousand. They range all the way from statutes imposing petty restrictions to those that tackle, with humorous complacency, the working of natural and inexorable economic laws. Neither lawyer nor layman can find a path in the tangled maze. The situation has become so intolerable that the leaders of the bar now see a necessity for "restating the law," and labor to that end so that the law may be first understood and then applied.

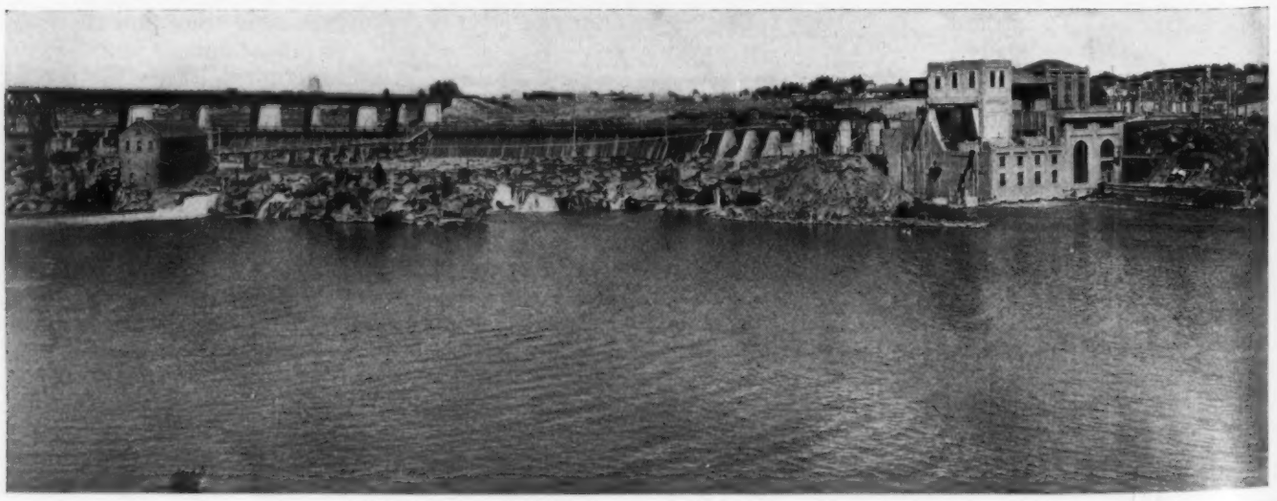
BUREAUCRACY IS DESTRUCTIVE TO DEVELOPMENT

The cumulative effect of this too frequent seizing of the legislative wand is over-centralization and bureaucracy. The country is too big and too diverse to be run efficiently in every detail by one centralized government. Its prosperity requires movements too swift for the straitjacket of bureaucracy. Furthermore, over-centralization produces duplication. It is safe to say that never in the history of the country has there been anywhere near the amount of duplicated effort by federal and local governments as now exists. Not only is this duplication costly but it dilutes the essential force and authority of government.

Bureaucracy will inevitably transform any government of law into a government of men. It increases public employees, multiplies regulatory exactions and laws, looks upon taxation as its privilege instead of the burden of those who pay, and, through its growth by subdivision and resubdivision, rapidly extends the functions of government. Its end result is to turn loose a horde of regulators and tax eaters who become self-appointed rulers superior to law.

Under such a form of government, there is no hope for business of a relationship that will efficiently promote the interest of society. Business is constructive. Bureaucracy is destructive. Their points of view are so opposed that business cannot live with bureaucracy in peace or prosperity or health. It is time to stop the flood of legislation, the multiplication of offices and office holders and the restrictions and oppressions upon business that follow in their wake. We need to hold fast to American institutions and the American form of government to enable business to continue the servant of the commonwealth.

After all, it can make little difference to the American business man whether he is "crowded off the sidewalk" by the swanking soldiers of a war-waging imperialistic government or by the hordes of tax eaters in the service of a bureaucratic government.



AUTOMATIC HYDRO STATION OF IDAHO POWER COMPANY AT AMERICAN FALLS. TWO 6,000-KW. UNITS ARE INSTALLED

SAN FRANCISCO SKYLINE FROM THE BAY

Water Power Makes California

By Frank A. Leach, Jr.
First Vice-President and General Manager
Pacific Gas & Electric Company

Phenomenal Growth Based on Utilization of Natural Resources—Accomplishments of the Electrical Industry

WHEN the National Electric Light Association meets in San Francisco June 15 five years will have elapsed since last the members of the N.E.L.A. assembled beside the waters of the Pacific for their annual convention. During that period the entire Pacific Coast has witnessed a spread of the electrical industry in all its branches of an extent never before recorded in any section of the country.

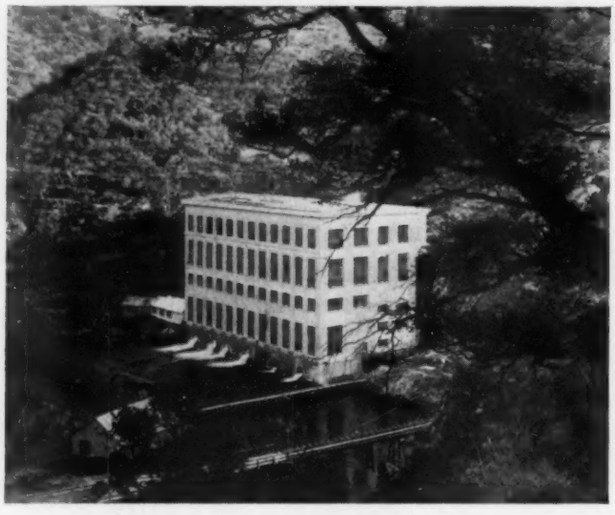
The State of California has been particularly active in the development of her natural resources, realizing the necessity of taking full advantage of what lies at her door in order to be in a position to meet the call upon those resources that a constantly increasing population and a truly phenomenal boom in agricultural and industrial activity must of necessity entail. At the time the N.E.L.A. met in Pasadena in May, 1920, the electrical industry on the Pacific Coast was faced with the accumulated shortage of generating capacity due to the lack of development during the war period, and with the peculiar conditions of a short water year there was a greater and more insistent demand for new service than ever before in the history of the state. It was estimated that the electric utilities at the time were in the neighborhood of 100,000 kw. of installed capacity short of what conditions called for. The reasons attributed to that state of affairs included a greater industrial activity, an enlargement of agricultural acreage, the greater use of electrical appliances and the increased cost of fuels used in the production of power. Hydro-electric developments were the logical solution to meet this shortage of power.

There had already been completed a consolidation of distributing facilities on the part of the utilities by interconnection of their high-tension transmission systems, involving a chain that stretched from Vancouver, Wash., to the Mexican border line, with the exception of a 30-mile gap between Vancouver and Kalama, Wash. That was considered a step in the direction of true conservation of power, for by this interconnection the many companies engaged in the generation and distribution of power could not only find a market for their product but also be placed in a position to assist one another in time of need. That same year of 1920 the interconnection was put to a practical test, for it was a season of so little rainfall that the Railroad Commission of California at the request of the power companies appointed a power administrator, who apportioned the power generated among the companies and consumers. A still more illustrative proof of the value of interconnecting systems was made in 1924 during the drought that followed the last and worst of a series of eight dry winter seasons; the result being that by skillful handling of available power sources and strict economy of operation and distribution most of the companies were enabled to supply their consumers. At the close of this anxious period engineers looking back upon the situation declared that during 1924 not one kilowatt of electric energy generated in the State of California had gone to waste.

A Big Construction Program

The situation revealed in the year 1920 acted as a stimulus for all companies having available undeveloped power resources to enter upon a construction program that, when completed, would lead them "out of the woods," so to speak, so far as concerned any danger of their being unable to meet the demand for power, which statisticians estimated to be increasing at the

rate of 10 per cent per annum. During the period from 1915 to 1920 the aggregate hydro-electric output of the California electric utilities had increased from 1,815,900,000 kw.-hr. to 2,568,541,000 kw.-hr. and the steam output from 414,900,000 kw.-hr. to something more than 1,167,000,000 kw.-hr. It was estimated that during the next five years to come the utilities must contemplate an increase in plant capacity of from 80,000 to 100,000 kw. per year in order to meet the growth in load; in addition, the next five years should see an increase in the relative capacity of hydro-electric power by at least 100,000 kw. to reduce the present excessive steam production, bringing the total to 500,000 kw., or a minimum per year of 100,000 kw. There had already been invested in physical plants and systems approximately $35,000,000, covering installation from the diversion of water in the mountains to the consumers' meters; it was figured that California must be prepared to



BIG CREEK POWER HOUSE NO. 2 HAS A CAPACITY OF 85,800 HP.

spend between $40,000,000 and $50,000,000 per year in new developments and extensions of existing systems.

The warning once sounded, the companies hastened to meet the situation presented, the result being that from one end of California to the other there has been unceasing hydro-electric constructional activity. All the major power concerns have contributed to the much-needed increase in plant capacities and distribution facilities. At the time of writing the outlook is decidedly encouraging. A summary of power data for California brought up to Jan. 1, 1925, gives the following figures:

	Kw.
Total installed capacity of hydro-electric systems in California in 1920	654,735
Total installed capacity as of Jan. 1, 1925	1,052,758
Total increase	398,023

The following are the most conspicuous increases: California-Oregon Power Company (California plants only), from 15,610 to 28,600 kw. installed capacity; Pacific Gas & Electric Company, from 196,700 to 317,000; Great Western Power Company, from 109,000 to 131,600; Western States Gas & Electric Company, from 7,025 to 23,030; San Joaquin Light & Power Corporation, from 82,450 to 84,600; Southern California Edison Company, from 106,350 to 280,530; Nevada-California Power Company (including the Southern Sierras Power Company and Holton Power Company), from 40,100 to 64,413 kw. installed capacity.

In addition to this it appears that in 1925 there will be a number of large installations brought into service; therefore to make a full five-year comparison we may include the following installations, all of which are expected to be completed by about July next:

	Kva.
Pacific Gas & Electric Company, Pit No. 3 development	81,000
California-Oregon Power Company, Copco No. 2	30,000
City of San Francisco, Moccasin Creek	70,000
Turlock District, LaGrange	4,000
Southern California Edison Company, Big Creek No. 1	25,000
Southern California Edison Company, Big Creek No. 2	16,000
Total	226,000

This total, added to previous figures of installed capacity, fulfills our 1920 estimate of needed 500,000 additional kilowatts for the five years.

Speaking for central and northern central California, where the interests I have the honor to represent operate, we have reason to congratulate ourselves upon the foresight our engineers displayed in selecting the Pit River region for the prosecution of important hydro-electric development work that has already added materially to the general output of electric energy and, by the time its chain of plants is completed will have added something like 670,000 hp. of installed capacity to the total hydro-electric power resources to which the people of California look mainly for their progress and development now and in the years to come.

Much has been written of this wonderful region, in the northeastern section of California, where the power sources are found in lava beds and where the geological formation is of a kind that permits streams rising east of the Cascade range to seep their way through and, gathering volume as they flow, pour oceanward with an even, dependable stream flow that appears to be but little affected by a wet or dry season. It is known, of course, to the engineering world that some construction work was done at Big Bend, on the Pit River, by the Mount Shasta Power Company many years ago and that the Pacific Gas & Electric Company upon purchasing the water rights owned by this concern and others further upstream decided to take full advantage of the fall of the Pit from above its intersection with Fall River and so construct a chain of major power plants, five in number, of the aggregate installed capacity noted above. It is generally known, also, that two 12,500-kva. plants on Hat Creek, a tributary of the Pit, were placed in service in 1921 and that the following year saw the opening of the first of the Pit chain, called Pit No. 1, with an installed capacity of 70,000 kva. and which for more than two years past has been contributing an average of 800,000 kw.-hr. a day to the output of energy that is fed to the wires of the great California interconnected system.

It is generally known, too, that soon after the completion of Pit No. 1 work was commenced on Pit No. 3, a development of 81,000 kva. ten miles down stream, where from the point of diversion a four-mile tunnel takes the water by direct route to turn the wheels of the power house on Lindsey Flat. This is a most pic-

turesque installation and will, no doubt, attract many visitors upon its completion. The construction work has proceeded uninterruptedly for a year and a half and at the time of writing the tunnel has been bored, the diversion dam partly constructed, the foundations for the power house finished. As stated above, it is hoped and expected that this installation will be completed by midsummer; and when that is done, there will be but a brief breathing spell, so to speak, for the engineering department before construction work starts on the next in order, Pit No. 4.

During all this time the Pacific Gas & Electric Company has not been idle in other quarters. Several new substations have been built in the five-year period dating from 1920. Newark substation, at the southern end of the "Pacific Service" transmission chain around San Francisco Bay, was completed early in that year, and after that in due course came the large distributing station called Vaca-Dixon, where the 220,000-volt lines from the Pit region end their journey, and the Claremont substation in the foothills back of Oakland, the new receiving station for high-voltage power from the mountains, where it is stepped down for retransmission to centers of distribution in Oakland and vicinity.

Then, about a little more than a year ago, our company undertook some reconstruction work upon its Drum-Spaulding system, in the Sierra Nevada Mountains near the Truckee summit, where by raising the dam at Lake Fordyce, the parent reservoir of the system, thereby doubling the storage capacity of that reservoir, and by enlarging Drum canal, building an additional penstock at Drum power house and an after-bay below Drum, the output of kilowatt-hours from the Drum-Spaulding system will be so increased as not only to furnish millions of additional kilowatt-hours to consumers in the Sierra region but also afford extensive additional irrigation facilities to farmers in the deciduous fruit lands of the Sacramento Valley around Auburn and Newcastle. The present waters of the Drum-Spaulding system now irrigate 26,000 acres of the most productive fruit orchards of the state.

To take proper care of the increased power load upon our lines it has been necessary, of course, to do considerable heavy work in the way of new substation equipment and general reinforcement of our transmission system. Besides, some necessary additions have been made to our steam-electric generating sources, notably at Sacramento, where a new turbo-generator of 12,500-kw. capacity was installed at the station on the river-bank to take care of conditions created by the drought in the early summer. So that, as a matter of fact, while the Pit river developments are first in the minds of hydro-electric engineers, not only because of their spectacular character but also because of their meaning in kilowatts of electric energy, the Pit River construction work during 1924 represented in actual expenditure about 36½ per cent of the total amount laid out upon the system. During the year 1924 there was expended altogether upon our electric system $25,000,000, of which sum $7,000,000 represented expenditures upon the Pit River developments.

CARIBOU POWER PLANT OF THE GREAT WESTERN POWER COMPANY IN A PICTURESQUE SETTING IN THE AMERICAN RIVER CANYON

Again speaking for the Pacific Gas & Electric Company, we find from the records that taking the period from September, 1920, to September, 1924, a period of four years, our electric consumers increased from 260,356 to 370,505, our annual kilowatt-hour sales from 967,802,800 to 1,305,322,065 kw.-hr., our annual electric output from 1,389,820,422 to 1,820,278,228 kw.-hr., our connected load from 836,289 to 1,328,041 hp. These percentages of increase, it will be noticed, range from 42.3 to 58.9 per cent.

These increases are due mainly to extensions of agri-

cultural and industrial activities throughout the state. New industries are cropping up daily, the most noticeable centers being the territory skirting the shores of San Francisco Bay. The manufacturer seems to have discovered that California is fitted by nearly every quality that counts for industrial development. Statistics compiled by the chambers of commerce of San Francisco and Oakland present some startling figures. The situation has even reached the point where great Eastern manufacturing concerns, particularly in the automobile business, are establishing branch factories out here. There is, as a matter of fact, every reason why California should be an industrial center. It has the land, it has the climate, it has the raw material.

Some interesting figures are at hand concerning electricity used upon orchard and farm. The Pacific Coast States, particularly the State of California, are farther advanced in farm electrification than any other agricultural section of the United States. There are two reasons for this exceptional progress: first, the need of power for irrigation in a large part of the farming territory; second, the many sources available for water-power plant development. In California alone it is estimated that on the ranches there are 35,500 electric motors in operation. These motors total approximately 483,965 hp. Eighty per cent of them are used for driving irrigation pumps. This unusually large demand for current, judging by Middle Western and Eastern standards, has been built up by liberal extension policies and low agricultural rates. As a result, there is a general use of electricity for lighting and barn power operations.

In the interior valleys, where wood, coal or oil is not readily available, cooking to a large extent is done by electricity. The favorable climatic conditions of the far West encourage the use of electricity for this purpose and it is estimated that there are 10,000 electric ranges in use on California farms.

There is in California a total of 167,504 rural light and power consumers—that is, consumers outside of incorporated limits of cities—who are served by 16,513 miles of rural distribution line, which is an average of 10.1 consumers per mile. Other figures that show the high electrical development of rural territory tell us that in California there are twenty-three inhabitants per rural consumer and 0.95 square mile of territory per rural consumer.

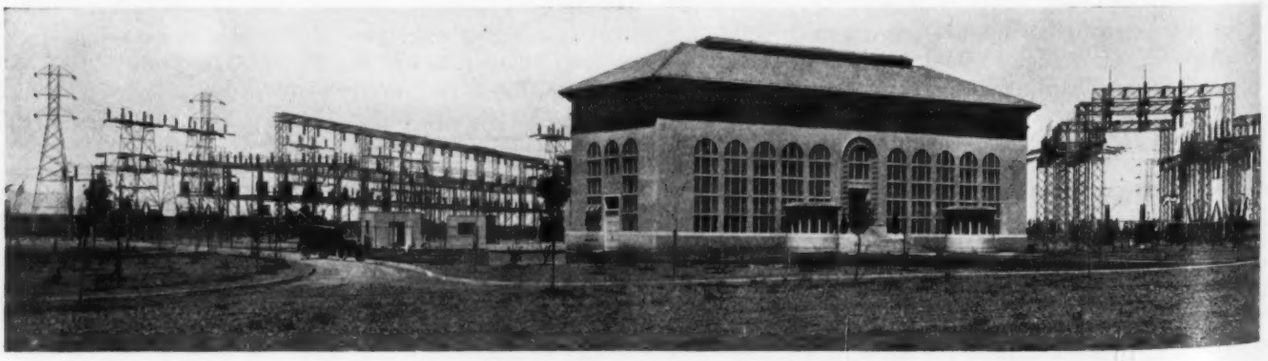
According to a national survey just completed, 2,185,000 new consumers were added to the central-station lines of the United States during 1923. California, with an increase of 213,016 consumers, leads all other states. In 1922 a survey of the Pacific Gas & Electric Company's system showed that service was supplied to 12,500 agricultural consumers, cultivating a total area in excess of 450,000 acres, who consumed a total of 108,181,961 kw.-hr., or 240 kw.-hr. per acre. The total agricultural connected load on the Pacific Gas & Electric Company's system in September, 1924, was 177,715 hp. and in September, 1923, 167,617 hp., an increase for the year of 10,098 hp.

For the year ended September, 1924, the sales on the Pacific Gas & Electric Company's system for agricultural power totaled 135,306,000 kw.-hr., and for the same period in 1923, 99,205,000 kw.-hr., an increase for 1924 of 36,101,000 kw.-hr.

A recent number of *California Journal of Development* contained an article upon the situation in California by Dr. Julius Klein of the Department of Commerce in Washington, D. C., in which the importance of securing foreign markets for California products was urged very strongly. In the opening of his article Dr. Klein wrote as follows:

"California is a great exporting state. Figures collected by the Department of Commerce for the first six months of the present year show that she has sold goods abroad already to the tune of nearly $109,000,000, or about $40 per capita. This gives her the position of fifth state in the Union as far as exports are concerned, as she is outranked only by New York, Pennsylvania, Texas and New Jersey and stands well ahead of such states as Ohio, Massachusetts and Connecticut, which have developed and consistently maintained a strong export tradition. Another feature of which California may be justly proud is that these exports represent with few exceptions the products of her own soil and the outcome of her own industrial development and do not, as in the case of certain other states, represent to a large degree shipments through her ports of commodities grown or manufactured elsewhere."

It is generally conceded that our Golden State owes her extraordinary development of recent years in a very great measure to cheap and available electric power. California, then, will give loyal welcome this year to the men of the electrical industry who have devoted their lives to the study of this mysterious energy that is hailed as the great twentieth century developer. On their part, our visitors to the 1925 convention, we hope, will avail themselves of the opportunity afforded to note for themselves what we in our Western land have done, are doing and expect to do.



THE VACA-DIXON SUBSTATION IS THE SAN FRANCISCO TERMINUS OF THE 220-KV. LINES

Securing and Retaining Public Favor

Involves the Sound Application of Business Principles — Begins at Home in the Selection of Men for Utility Tasks—Two of the Essentials to Achieve This Are Good Service and Proper Public Contacts

By J. F. Owens

Vice-President and General Manager
Oklahoma Gas & Electric Company

AS I VIEW IT, the maintenance of proper relations with the public we serve is merely a question of adopting in our public contacts ordinary rules of business relations that successful men have found through trial to be workable.

To put it in another way, the relations of a public utility company with the public should be in no sense different from the relations that should be maintained by an organization engaged in the most highly competitive business. There is this exception, however. Public utilities are essentially monopolies and there is inherent in the mind of every one a feeling of antagonism at being forced to do business with one concern, and one alone—a feeling of resentment at not being privileged to choose between two or more organizations when it comes to a question of patronage. For this reason it behooves the public utility so to conduct its business that its service shall be better, its treatment of the public more courteous, the attitude of the members of its organization more considerate than if the company were engaged in a keenly competitive business.

Many of us have approached this question of public relations with the thought that it is a sort of pot of gold at the end of a rainbow; that we have but to set up a public relations department, advertise that such a department exists and lull ourselves with the delusion that the very fact that we have given attention to the question will be sufficient to cure all our ills.

My own view is that proper relations with the public, like charity, begin at home, and that the first consideration in determining whether our public will view our company with the degree of approbation and confidence we all desire depends on the personnel of our organization. Our personnel should be made up of men and women thoroughly conscious of their responsibilities, thoroughly cognizant that they are public servants in the biggest and broadest sense and thoroughly awake to expanding the service of the company. Every member of the organization should be forward looking, ambitious and alert. Because he is thoroughly sold on his own organization, he will realize that his chance of advancement depends upon the advancement of the company as a whole. He will know that as the organization grows and progresses in public favor his opportunities are increased and his individual chances for betterment are enhanced.

No one would think of purchasing a turbine or any other mechanical device so necessary to the conduct of our business without applying to that turbine all the recognized tests to determine its fitness for the work expected of it. Not only this, but after it has been put into service no operator would think of allowing such an intricate piece of apparatus to run without careful and watchful attention. High-priced and thoroughly trained attendants are employed to supervise carefully all its operations and to be certain at all times that it is in condition to fulfill its functions properly.

Yet when it comes to the selection of the most important element of our business, the human element, too frequently not only we in the public utility business but men in all lines of business pay little or no attention to the fitness of the individual to the task to which he is to be assigned. Very rarely are even those tests that common sense would dictate applied to the individual to determine his fitness for the job. A foreman needing a man takes the first that is offered, contenting himself with determining whether the man has a strong back and adequate muscle capacity; rarely does he look into the question of his mental capacity, his fitness for team work, his hopes and aspirations, his ambitions, his environment or even his past history to determine whether or not his record is such as would warrant his being taken into the organization.

Even supposing that care has been taken in the selec-

tion of a man, that his past record has been carefully investigated, that full consideration has been given to his fitness for the job and that the test of his mental capacities has proved his worthiness, all too frequently he is forgotten in so far as keeping track of his record of performance is concerned. Nothing is done to inspire him with a forward-looking attitude and he is allowed to drift aimlessly, to mold his own destiny without help or direction.

The whole scope of public relations depends primarily on the members of the organization of a public utility, from the general manager down to the man in the ditch. To the extent that the employees are carefully selected, thoroughly informed not only as to the particular job to which they have been assigned but as to the policies and hopes of the organization, thoroughly impressed with the fact that they are important members of the staff, thoroughly convinced that if they properly perform their duties and take advantage of the opportunities offered through business and social contacts to further the interests of the company—to that extent in a large measure will depend the success or failure of creating in the minds of the public a favorable attitude toward the organization.

GOOD SERVICE AND PROPER CONTACTS ESSENTIAL

Satisfactory public relations from the public utility point of view must be grounded upon two essentials: First, good service, and second, proper public contacts. The two are of equal importance and each is intimately bound up with the other. My own belief is that good service is impossible without proper public contacts, and that the reverse is also true—that having once made proper contact with the public, good service will follow, as the night follows the day. Good service means extraordinary service, not simply that lights come on when the switch is pushed. It means that the public receive intelligent, courteous and abundant cooperation from the organization furnishing it.

There is hardly a utility operator that does not feel disgraced if the community he serves is allowed to become dark, but too many of us, I fear, feel that our duty ends here. Good service, to my way of thinking, means that the user of the service is thoroughly informed as to the policy of the company furnishing it. Good service is impossible unless the user is convinced that it is honest service, that he is paying no more than the service is worth; unless his demands, no matter how trivial, how apparently ridiculous or seemingly unreasonable, are met with courteous, prompt attention.

The second phase of the question of public relations relates to public contact. In the broad sense contact with the public is the contact that is made by every member of the organization, from the general manager down to the man in the lowest rank. It is a trite saying, but one that will bear frequent repetition, that the impression of the company received by the average user of utility service is obtained through his contact with the member of the organization whom he happens to know. To him the company is not the general manager, nor is it any other officer; it is the meter reader, the meter setter, the contract clerk, the telephone operator, the man or woman connected with the company who happens to be his neighbor. It may be that his impression of the company is obtained from the member of the organization with whom he comes in contact in church, in Sunday school, at the club, or even at the baseball park.

Obviously, it is a difficult matter to follow these contacts that are in a sense extraordinary contacts. One thing we can do, however, and that is to see that the contacts made through ordinary business operations are what they should be. We can see that no one leaves the office of a utility organization without being satisfied that the company has done its utmost to give him the full measure of service to which he is entitled. We can see that this is courteous service. We can see that the men and women at the contract desk, at the adjustment counter, in the credit department, in the service department or "complaint department," as it is sometimes called, that the man who sets the meter and the man who reads the meter are all persons of pleasing personality, courteous, affable, patient, painstaking and, above all, well informed.

We can see that the telephone operator has knowledge not only of the operation of the switchboard but of interdepartmental relations, so that when a call comes in from a customer there may be no delay in reaching the member of the organization who can handle the situation with the greatest ability and discrimination. We can see that the public is informed as to the purposes and policies of the company through intelligent advertising that is carefully prepared, thoroughly frank and straightforward. We can see that every member of the organization who shows a peculiar fitness for expressing himself intelligently through the spoken word is given the opportunity to appear before clubs and social organizations and there discuss the company, its aims and ambitions. In other words, we can see that our contacts with the public are as bright and clean and thoroughly effective as are our mechanical contacts in the generation and distribution of the physical service that we render.

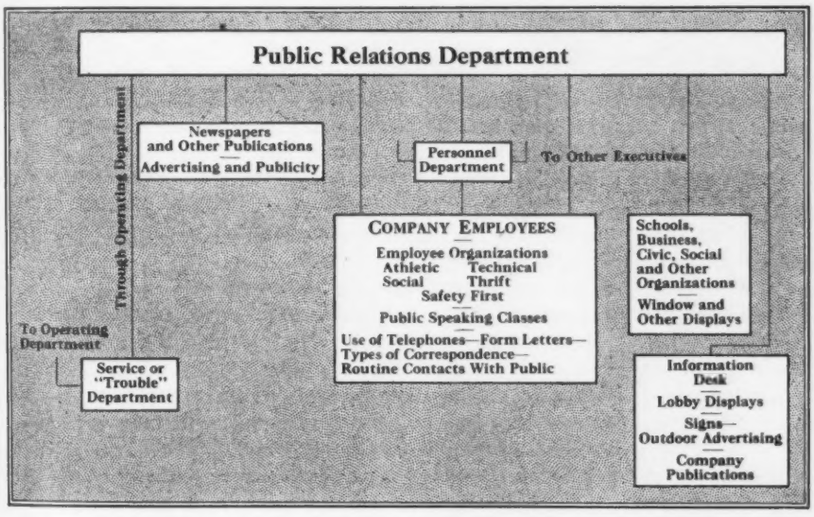
I believe this question of public contact is important enough that it be headed by a thoroughly trained, extraordinary executive. For that reason I believe thoroughly in the establishment of a department which, for want of a better name, is frequently called "public relations department." Frankly, I don't like the name, but nothing better seems to be offered, so perhaps it will have to serve.

The first duty of a public relations department should be to lend its efforts to the education of the individual employee, to impress him with the broad policies of the company, to assist him in understanding its larger problems and its attitude toward the people it is privileged to serve. In short, it should endeavor to give him an outlook on the business that will in effect make him a missionary among the people and organizations with which he comes in contact. Nor does the job of the public relations department stop here. It should build up within the organization such a morale that the members of the employee's family are additional missionaries for the company to the public. It is the duty of the director of public relations to bring closer together employees in each department with employees in the same department and with employees in other departments and to do away with interdepartmental jealousies and bickerings. It is his function to encourage study on the part of the individual members of the

organization, to the end that not only may they be better fitted for the particular work in which they are engaged but that they may be constantly fitting themselves for better positions; in other words, he should encourage initiative and foster ambition.

His second function is that of studying, analyzing, and continually following up the phases of company operation, of different departments, by means of which the customers receive their impressions of the company. By this I mean particularly the telephone switchboard, the individual telephone, form letters, contacts and relations at contract, cashier and adjustment windows, general correspondence, efficiency department, service department (formerly trouble department) and the many other places where a utility company meets its customers in one way or another; to see to it that at every such meeting place courtesy, efficiency, and honesty are the fundamentals upon which the company's attitude toward the public is founded.

His third function in the conduct of his department should be one of intimate contact with and education of the public. Under this heading comes newspaper and other progressive advertising and publicity. The policy of the company toward the press should be one of absolute frankness, and to that end the organization should exert itself to the limit to see that the newspapers in the communities in which it operates receive absolutely complete information about every occurrence or activity that could broadly be interpreted as news.



OUTLINE OF PUBLIC RELATIONS DEPARTMENT ACTIVITIES AND CHANNELS OF PROCEDURE

Here again is a splendid opportunity for the one who makes contact with the press to furnish extraordinary service in obtaining information of public interest not directly connected with the utility organization.

The attached chart or outline of a public relations department indicates, to my mind, the contacts it should have within and without the organization.

It will be noted that prominently connected with the public relations department is the department of personnel. I have attempted to emphasize throughout all of this discussion the importance of the proper selection and training of the individual member of the organization. In our own case, this function is deemed important enough to be placed in charge of a special man, whom we have called "personnel manager." This man is more than an employment agent. He has served for years with the organization in various capacities, is thoroughly familiar with its purposes and policies and, through actual experience, with the operation of the most important contact departments in our organization. His duties may be listed as follows:

Handling of applications.
Classifying applicants through qualification cards.
Physical examination and subsequent insurance.
Confidential record twice a year from each member.
Graphic rating report on each member twice a year.
Monthly detail reports on resignations, dismissals, etc.
Daily statistics on applicants' entries and exits.
Monthly report showing applicants' entries and exits.
Promotion chart.
Outside educational courses.
Vocational classes in organization.
Lecture courses.
Job analysis.

We operate on the theory that every applicant for a position with our organization is entitled to a patient, courteous interview and a thorough study of his qualifications for the position for which he is applying, regardless of whether or not there happens at the moment to be a vacancy. The applicant is given to understand that his previous employment record will be checked very carefully and that should he enter the organization a careful record will be kept of his work, to be used later should he leave the organization and refer a proposed employer to us for information. We insist that every applicant pass a physical examination. We feel this is only fair and just to the present members of our organization and to the stockholders of the company, in that it frequently eliminates men or women who might be physically unfit to carry on the duties of the position for which they are making application. We provide group insurance for the members of our organization and the examination at the time of their entering is combined with the physical examination.

Space will not permit a detailed discussion of each phase of the operation of the personnel department. Perhaps the confidential report warrants special mention. This record has for its object the reminding of every member of the organization that he is being given careful attention and consideration, for the reason that the company is vitally interested in his hopes and aspirations and desires to know just what he is doing by way of bettering himself with a view toward progressing in the organization. There is nothing compulsory or paternalistic about this record. Each member of the organization is given to understand this, but at the same time is reminded of the company's interest, through the personnel department, and that this method is the only one by which the company can keep in touch directly with each one and know what he is doing to qualify himself for a better position.

In addition to the confidential record obtained from each member of the organization twice a year, the personnel department requires of each department head a confidential record card twice a year. The personnel manager, therefore, has the card of the individual member, and, in addition, the estimate of the department head of his worth and the value of his work and particularly his fitness for advancement.

An important feature of the work of the personnel department is the inauguration of a system of lecture courses. This consists of a series of talks by department heads or prominent men or women outside of the utility business for those members of the organization who come in contact with the public. The lectures are non-technical, so that any one can understand them fully. Questionnaires follow each lecture, to be answered and turned in later by the member. This stimulates interest. Back of it all, however, is the hope of impressing on the hearer and the interdepartment heads the need of co-ordination and co-operation within and among the various departments, and is again on the theory that one uninformed or inefficient member of the organization in an important contact position can do more harm in a day than a year of close educational effort will build up.

AVOID PATERNALISM WITH COMPANY EMPLOYEES AND THE PUBLIC

We are fully aware that in the carrying out of such policies as those outlined there is danger of the feeling that the company is adopting a paternalistic attitude toward its company members. I am frank to say that this must be guarded against. Any intracompany development must be slowly and carefully worked out. In our own organization we have had a public relations department for the past five years and we have not yet reached, and I was about to say probably never shall reach, the goal of our ambitions. Nevertheless progress is evident and can be measured and the goal can be defined quite definitely.

Care and caution are essential in the process of building and rebuilding an organization. Company spirit and morale are not obtained in a day and must be built patiently from the ground up. Because of its great importance, it is far better to be cautious than sorry, but there is no fixed formula; in fact, there can be none for obtaining solid co-operation on the part of the company membership.

In securing public good will, there must be first of all on the part of the management a full, frank, open, honest policy; there must be a recognition that it is not sufficient that this policy be adopted, but that it is important that it be carried out by every member of the organization. To do this, every member of the organization must be informed, must be in sympathy with the organization's policies and must thoroughly understand them. There must be more. The public in turn must be brought to understand what these policies are, and, understanding them, be in sympathy and accord with them.

CO-OPERATION AND INTELLIGENCE KEYS TO SUCCESS

To summarize, proper public relationship means the entire co-operation of company executives, company personnel and the public. This co-operation can be reached only by painstaking, careful, intelligent effort to inform all of the parties to the service as to the part they must play in its rendition.

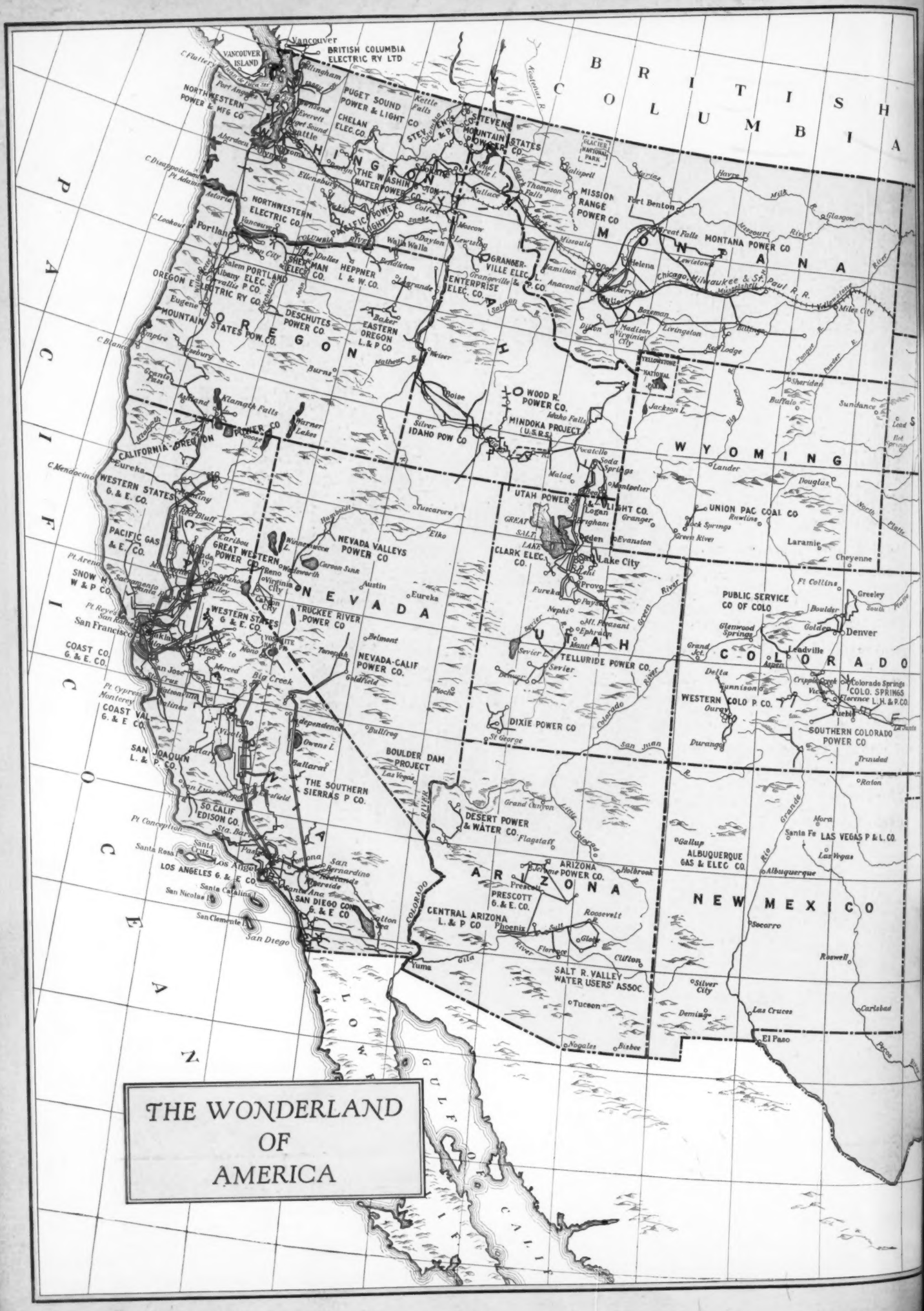
A final word. The maintenance of correct public relations is a never-ending process. It is one job that is never finished. There can be no let-up in our activities. There is danger in the feeling that we have arrived; that our relations with the public are what they should be and that we may rest on our oars. The demagogue is still with us, and always will be. His activities never cease. They never will. Public opinion must not only be properly informed, it must be kept informed. It is not enough to advertise our policies when we are in trouble. The effect of proper advertising at such times is good, but its effect is better if given at a time when there is no storm in the offing. Every utility should be a consistent and persistent advertiser—in the press, on the platform, through its own personnel; in fact, in every way. Eternal vigilance is the price of public good will. It is not too great a price to pay.

RIVER BANK PLANT OF THE OKLAHOMA GAS & ELECTRIC COMPANY AT MUSKOGEE

THE WONDERLAND OF AMERICA

The cataract comes down, a broken roar;
The palisades defy approach and rise,
Green-mossed and dripping, to the clouded skies.
The canyon thunders with its full of foam,
And calls loud-mouthed, and all the land defies;
The mounts make fellowship and dwell at home
In snowy brotherhood beneath their purpled dome

—JOAQUIN MILLER


BRITISH COLUMBIA
PACIFIC OCEAN
Vancouver
VANCOUVER ISLAND
BRITISH COLUMBIA ELECTRIC RY LTD
NORTHWESTERN POWER & MFG CO
PUGET SOUND POWER & LIGHT CO
CHELAN ELEC. CO
STEVENS & P.
STEVENS MOUNTAIN STATES POWER CO
WASHINGTON
THE WASHINGTON WATER POWER CO
PACIFIC POWER & LIGHT CO
NORTHWESTERN ELECTRIC CO
Portland
OREGON ELECTRIC RY CO
SALEM PORTLAND ELEC.
Albany ELEC.
Corvallis P CO
THE DALLES
SHERMAN ELEC. CO
HEPPNER L & W. CO
GRANGER-VILLE ELEC. CO
ENTERPRISE ELEC. CO
MISSION RANGE POWER CO
MONTANA
MONTANA POWER CO
Great Falls
Helena
Butte
Anaconda
Chicago, Milwaukee & St. Paul R. R.
OREGON
MOUNTAIN STATES POW. CO.
DESCHUTES POWER CO
EASTERN OREGON L. & P CO
Baker
Burns
Boise
WOOD R. POWER CO.
MINDOKA PROJECT (U.S.R.S.)
IDAHO POW CO
Idaho Falls
Jackson L.
YELLOWSTONE NATIONAL PARK
WYOMING
Cheyenne
Laramie
Lander
Sheridan
Buffalo
Sundance
Miles City
Billings
Bozeman
Livingston
Rock Springs
Rawlins
Green River
UNION PAC COAL CO
CALIFORNIA-OREGON
Klamath Falls
Warner Lakes
Eureka
WESTERN STATES G. & E. CO.
PACIFIC GAS & E. CO.
GREAT WESTERN POWER CO
NEVADA VALLEYS POWER CO
NEVADA
Reno
Carson Sink
Austin
Eureka
Elko
TRUCKEE RIVER POWER CO
NEVADA-CALIF POWER CO.
Tonopah
Belmont
Goldfield
Bullfrog
UTAH POWER & LIGHT CO.
CLARK ELEC. CO.
GREAT SALT LAKE
Salt Lake City
Ogden
Logan
Provo
Evanston
UTAH
TELLURIDE POWER CO.
Sevier
Nephi
Mt. Pleasant
Ephraim
Manti
Green River
PUBLIC SERVICE CO OF COLO
Ft Collins
Greeley
Boulder
Denver
Golden
Glenwood Springs
Leadville
Grand Jct.
COLORADO
Delta
Gunnison
Crested Butte
Colorado Springs
COLO. SPRINGS
Florence L. H. & P.CO.
Pueblo
WESTERN COLO P CO.
Ouray
SOUTHERN COLORADO POWER CO
Durango
Trinidad
Raton
SAN FRANCISCO
COAST CO. G. & E. CO.
COAST VAL. G. & E. CO.
SAN JOAQUIN L. & P. CO.
Big Creek
Dependence
Owens L.
Ballarat
Bishop
Mono
Yosemite
Merced
San Jose
Santa Cruz
Monterey
Pt Cypress
Pt Reyes
Pt Arena
Mendocino
Pt Conception
Santa Rosa
Santa Cruz
Los Angeles
LOS ANGELES G. & E. CO.
SO. CALIF EDISON CO.
Santa Barbara
Pasadena
San Bernardino
Riverside
Santa Ana
SAN DIEGO CONS. G. & E. CO
San Diego
San Nicolas I.
Santa Catalina I.
San Clemente I.
THE SOUTHERN SIERRAS P CO.
BOULDER DAM PROJECT
Las Vegas
DESERT POWER & WATER CO.
Grand Canyon
Flagstaff
DIXIE POWER CO
St George
ARIZONA POWER CO.
Holbrook
Prescott
PRESCOTT G. & E. CO.
CENTRAL ARIZONA L. & P CO
Phoenix
Roosevelt
Globe
Florence
Clifton
Yuma
SALT R. VALLEY WATER USERS' ASSOC.
Tucson
Nogales
Bisbee
Silver City
Deming
Las Cruces
Carlsbad
El Paso
NEW MEXICO
Socorro
Roswell
Gallup
ALBUQUERQUE GAS & ELEC CO.
Albuquerque
Santa Fe
LAS VEGAS P & L. CO.
Las Vegas
Mora
Rio Grande
Colorado R.
Gila R.
San Juan R.
Green R.
Platte R.
Missouri River
Yellowstone R.
Columbia R.
Kootenai R.
Snake R.
Salmon R.
Big Horn R.
Powder R.
Milk R.
Glasgow
Havre
Fort Benton
Missoula
Kalispell
Glacier National Park
Coeur d'Alene
Spokane
Kettle Falls
Wenatchee
Ellensburg
Yakima
Walla Walla
Lewiston
Moscow
Pullman
Colfax
Dayton
Grande Ronde
Pendleton
Hood River
The Dalles
Astoria
Aberdeen
Olympia
Tacoma
Seattle
Everett
Port Angeles
Bellingham
Juan de Fuca Str.
C. Flattery
C. Disappointment
Pt Adams
C. Lookout
C. Blanco
Empire
Coquille
Grants Pass
Ashland
Eugene
Salem
Willamette R.
Columbia R.
Deschutes R.
Owyhee R.
Malheur R.
Weiser
Payette
Twin Falls
Pocatello
Soda Springs
Malad
Montpelier
Preston
Tuscarora
Humboldt R.
Truckee R.
Carson R.
Walker L.
Winnemucca L.
Pyramid L.
Lahontan
Fallon
Hawthorne
Tonopah
Goldfield
Beatty
Las Vegas
Pioche
Caliente
Bullfrog
Death Valley
Owens L.
Mono L.
Ballarat
Bakersfield
Tehachapi
Mojave
Barstow
Victorville
Redlands
Riverside
Santa Ana
Pasadena
Santa Barbara
Pt Conception
Santa Rosa I.
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Florence
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Prescott
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Grand Canyon
Little Colorado R.
Holbrook
Roosevelt
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Silver City
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Carlsbad
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Albuquerque
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Raton
Trinidad
Durango
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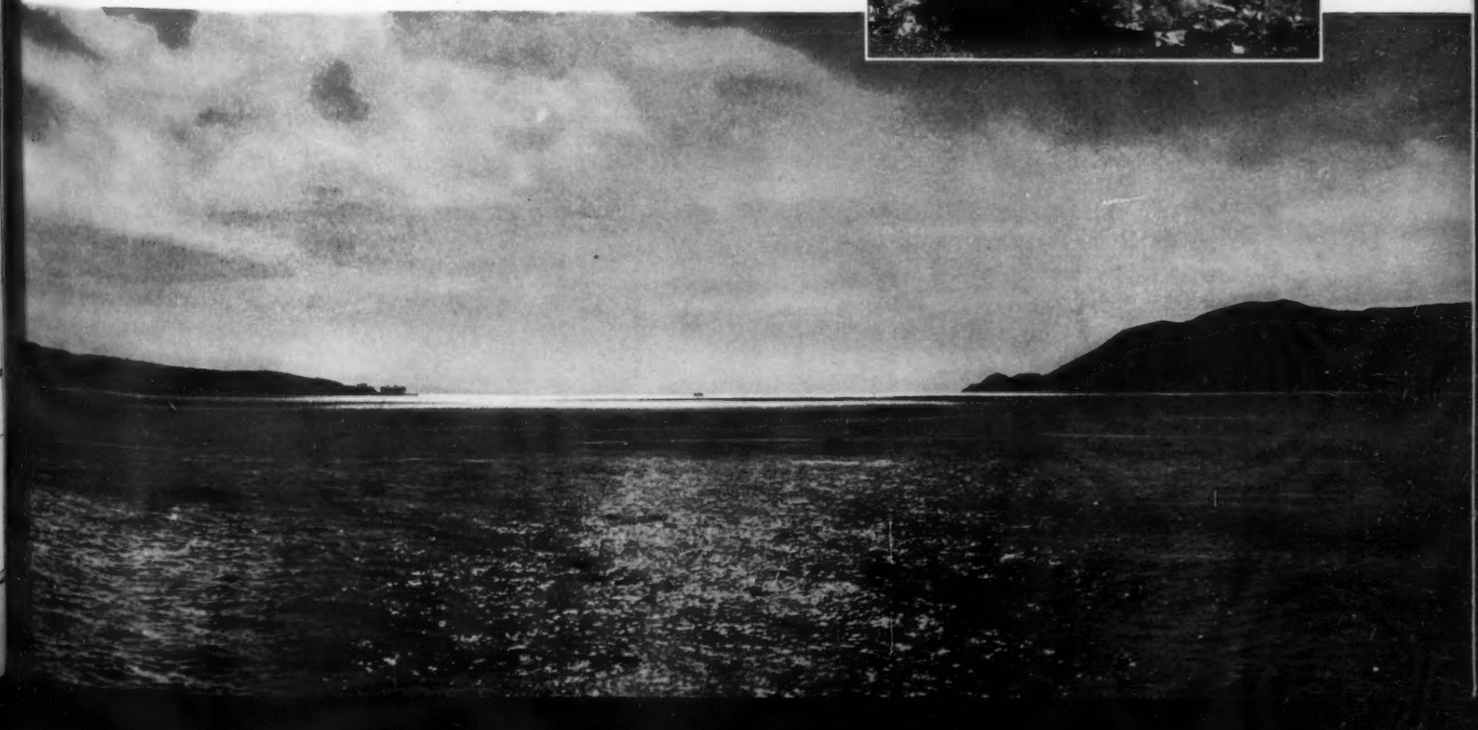
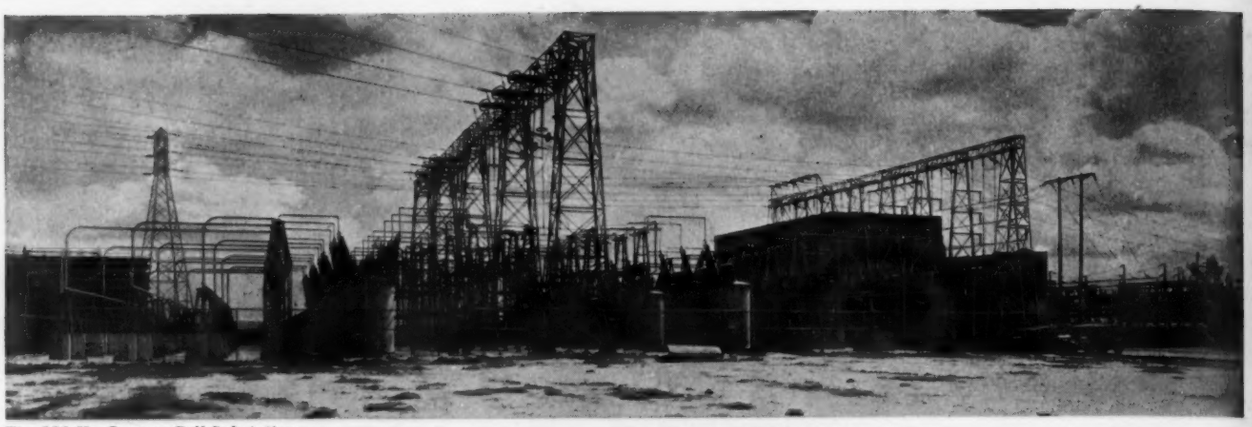
Provo
Logan
Brigham
Granger
Malad
Montpelier
Soda Springs
Pocatello
Idaho Falls
Jackson L.
Yellowstone National Park
Sheridan
Buffalo
Sundance
Lead
Hot Springs
Miles City
Billings
Bozeman
Livingston
Big Timber
Red Lodge
Butte
Anaconda
Helena
Great Falls
Lewistown
Havre
Glasgow

OUT WEST, man has used the beauty and the treasures of Nature to increase his possibilities for achievement. The mountains, canyons, plains and deserts endow the country with unparalleled beauty and natural resources enchance its material values. Gold still is mined; silver and baser metals are found in profusion; coal and oil abound. Vast forests cover large areas and varied products spring from fertile soils. ❦ But the West possesses a greater resource than these. Water, regarded lightly in the days of '49, was then as now the most beautiful element in this land of wonders. It has become also the most useful. It has made possible the production of electricity for light and power; it has irrigated and transformed the deserts. ❦ As a material asset and as the greatest single contribution to scenic grandeur water reigns supreme.

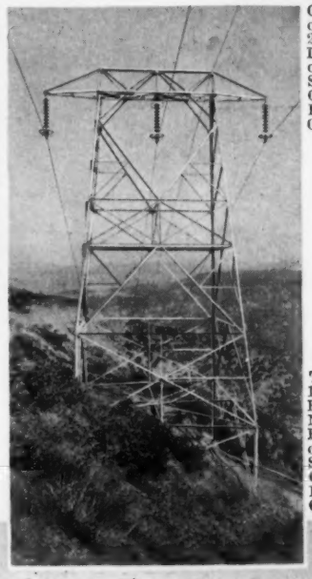




The 220-Kv. Laguna Bell Substation of the Southern California Edison Company

The swaying line of the Sierras is the source of the water which has been instrumental in bringing about the agricultural and electrical development of central and southern California. Architecturally attractive power houses in the mountains pour their energy into 220-kv. lines to give light and power to the fertile plains of the coastal regions

Big Creek Power House No. 8 of the Southern California Edison Company

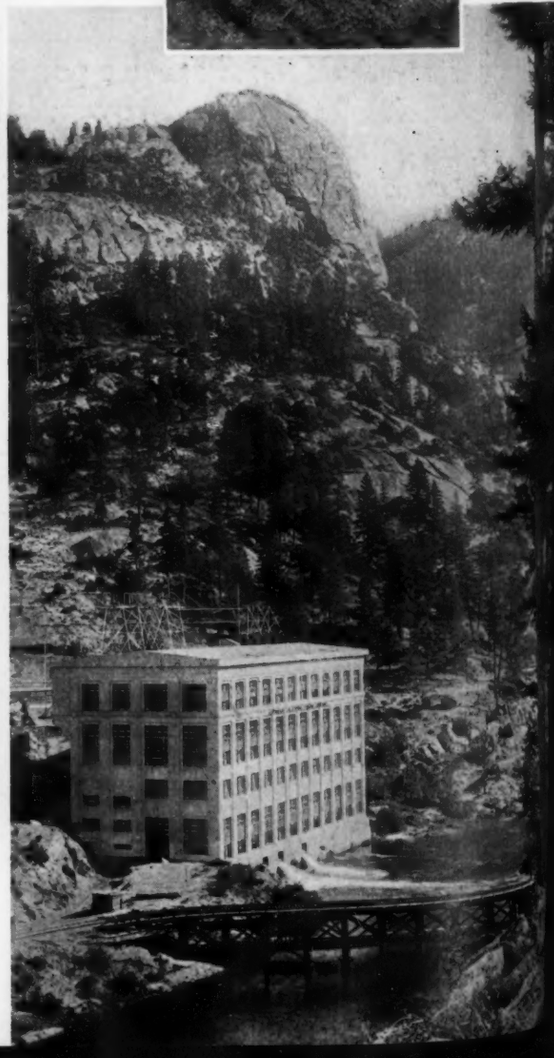


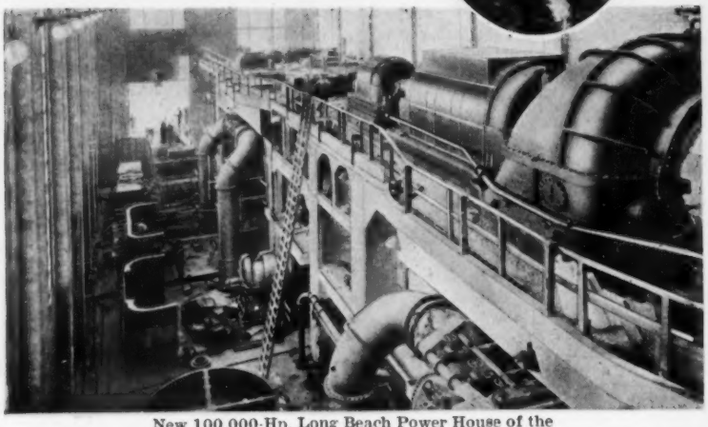
One of the 220-Kv. Lines of the Southern California Edison Company

El Dorado Power House of the Western States Gas & Electric Company is on the celebrated American River

The 100,000-Hp. Big Creek No. 1 Power House of the Southern California Edison Company

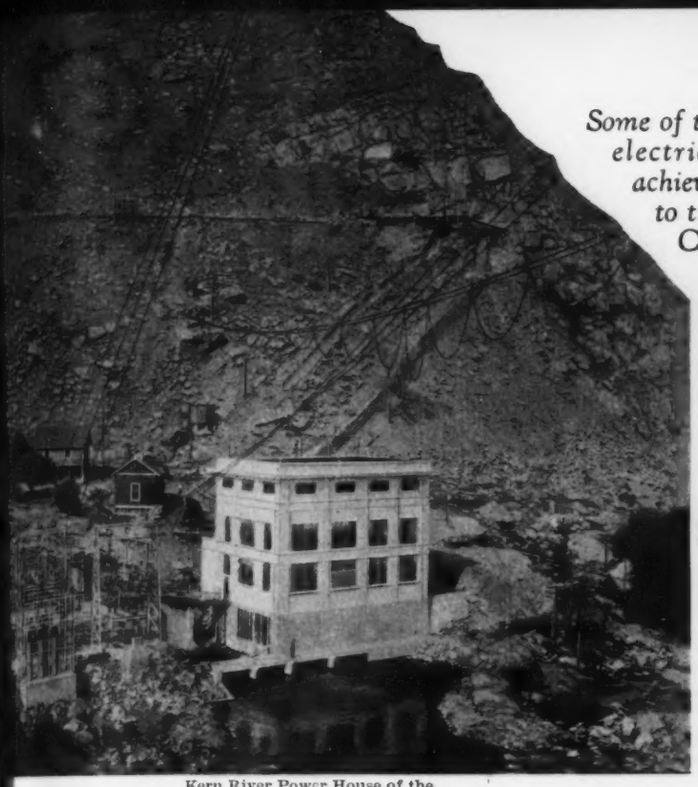
Huntington Lake stores water for the Southern California Edison Company



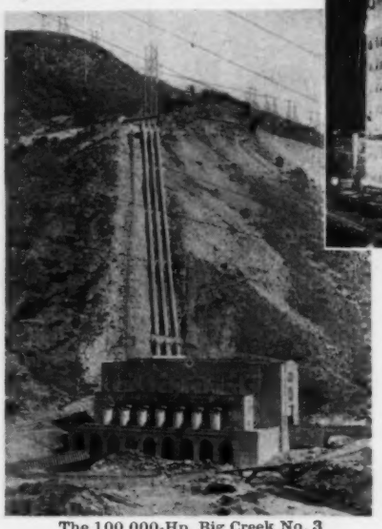


New 100,000-Hp. Long Beach Power House of the Southern California Edison Company

Some of the most notable hydro-electric and transmission achievements have been due to the electrical pioneers of California

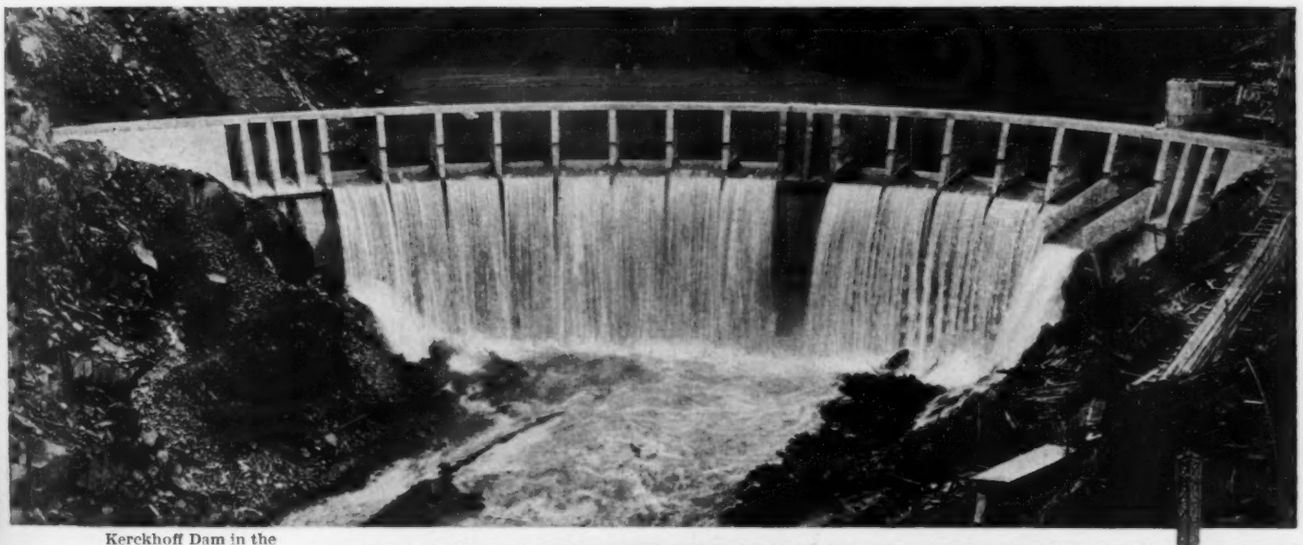


Kern River Power House of the
San Joaquin Light & Power Corporation



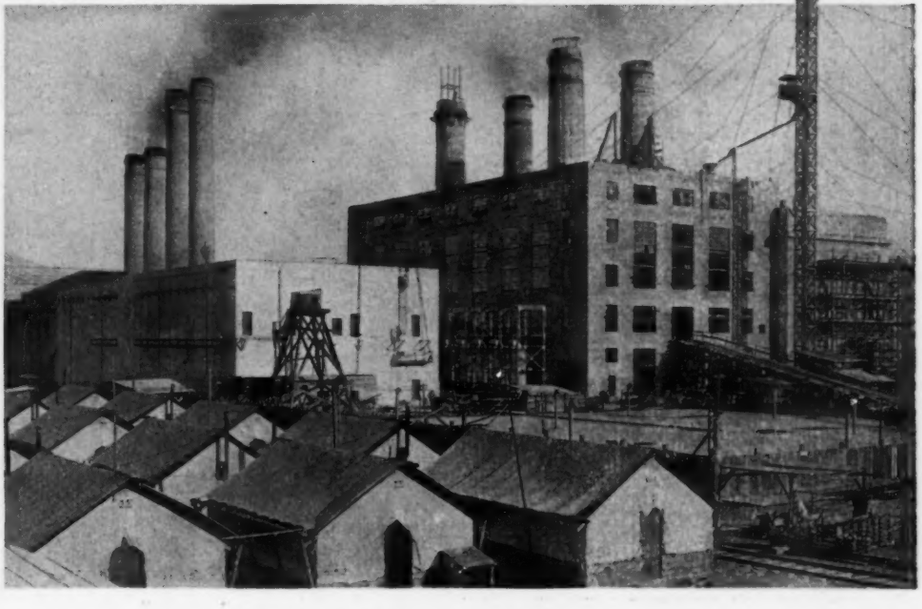
The 100,000-Hp. Big Creek No. 3
Power House

Headquarters Building
of the
San Joaquin
Light & Power Corporation

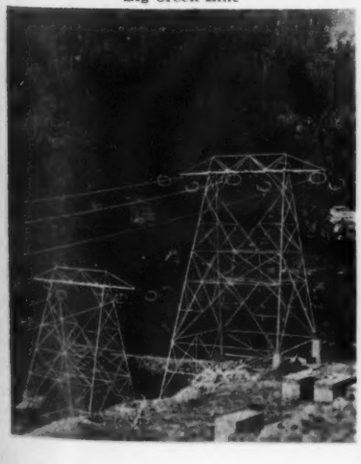


Kerckhoff Dam in the
San Joaquin River

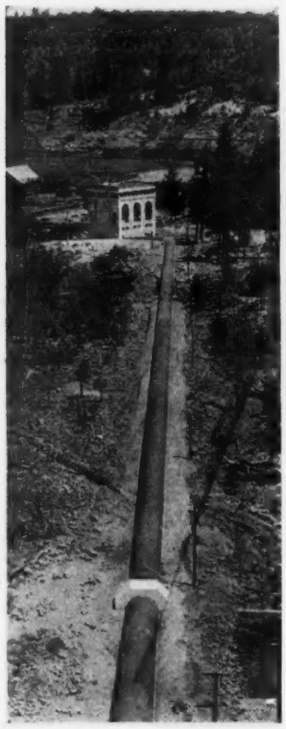
Switch
House
and
Exterior
of Long
Beach
Station



Dead-End Towers
on the 220-Kv.
Big Creek Line

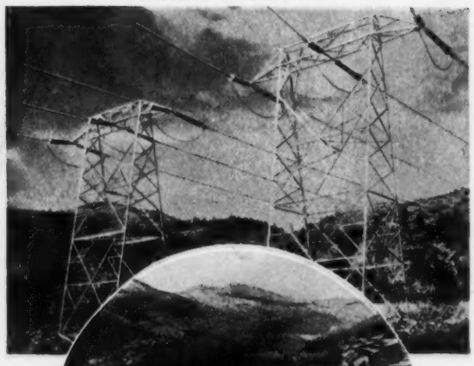


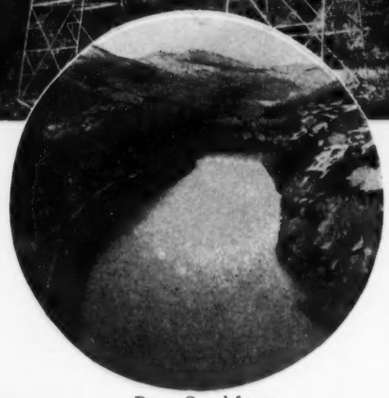
Pit River in the north and Big Creek in the south represent daring engineering projects of great size requiring the expansion of hydro-electric and transmission practices beyond previous limits



Hat Creek No. 1 Power House

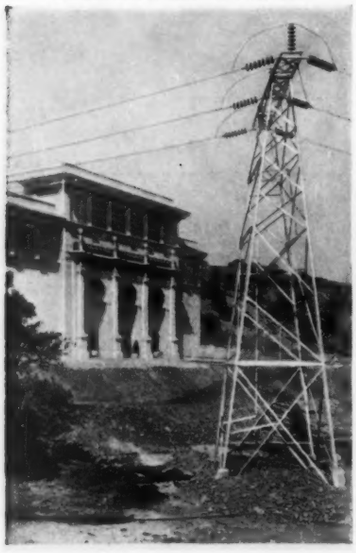
Pit River 220-kv. Lines



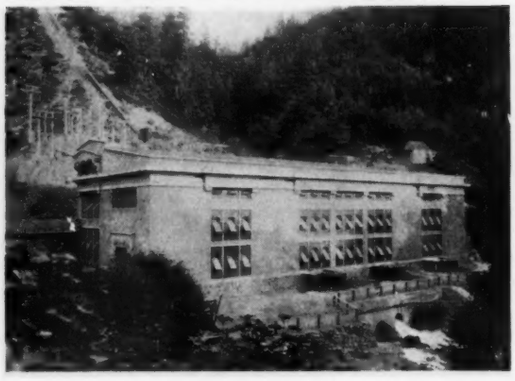


Drum Canal from Lake Spaulding

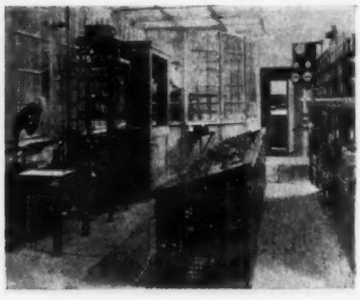
Cordelia Substation of the Pacific Gas & Electric Company

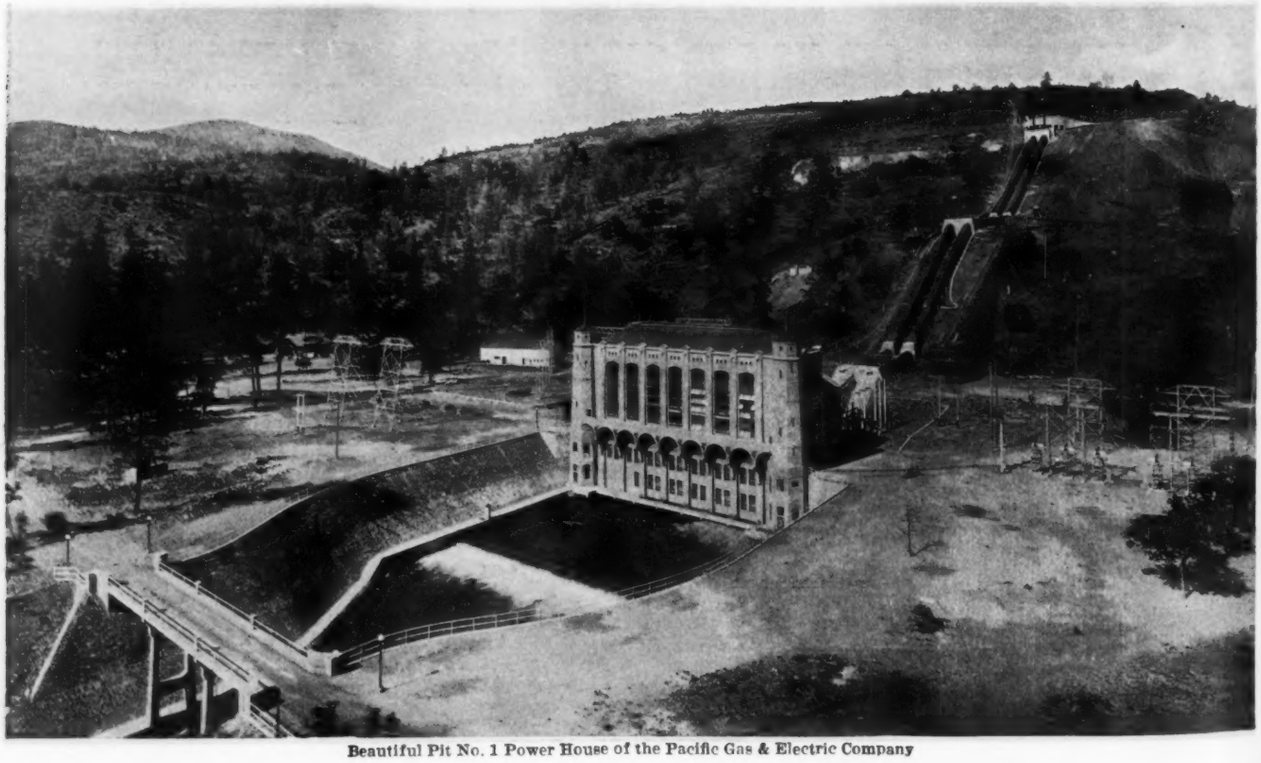


Drum Power House of the Pacific Gas & Electric Company

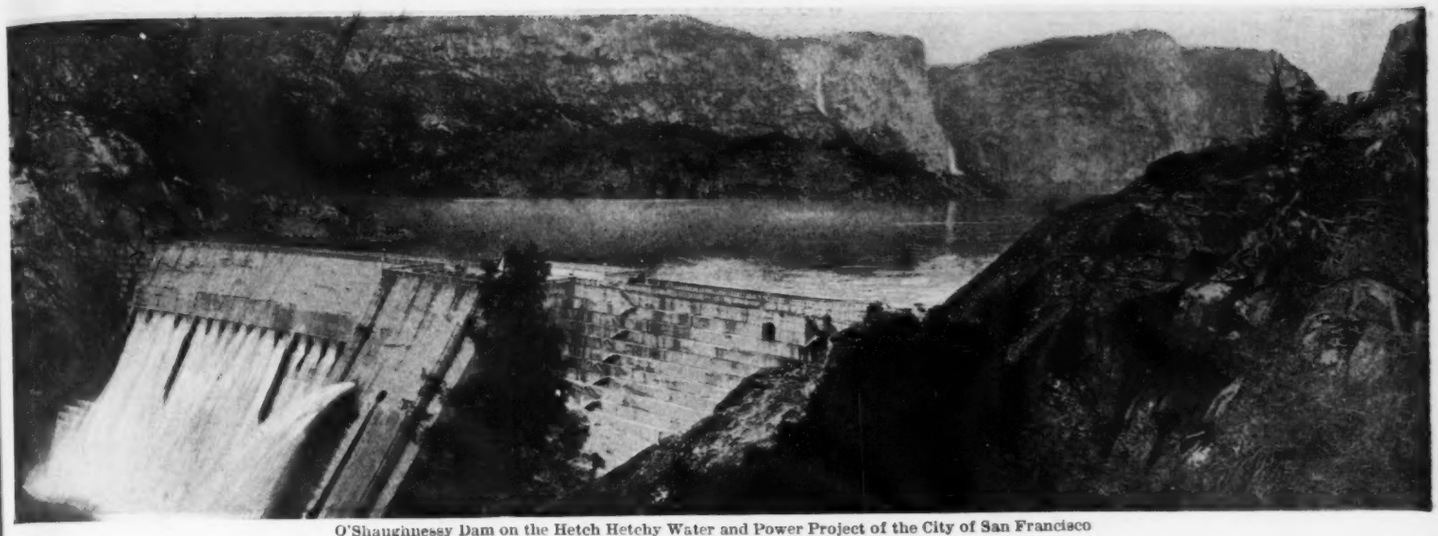


Switch Gallery and Operating Room in Pit No. 1

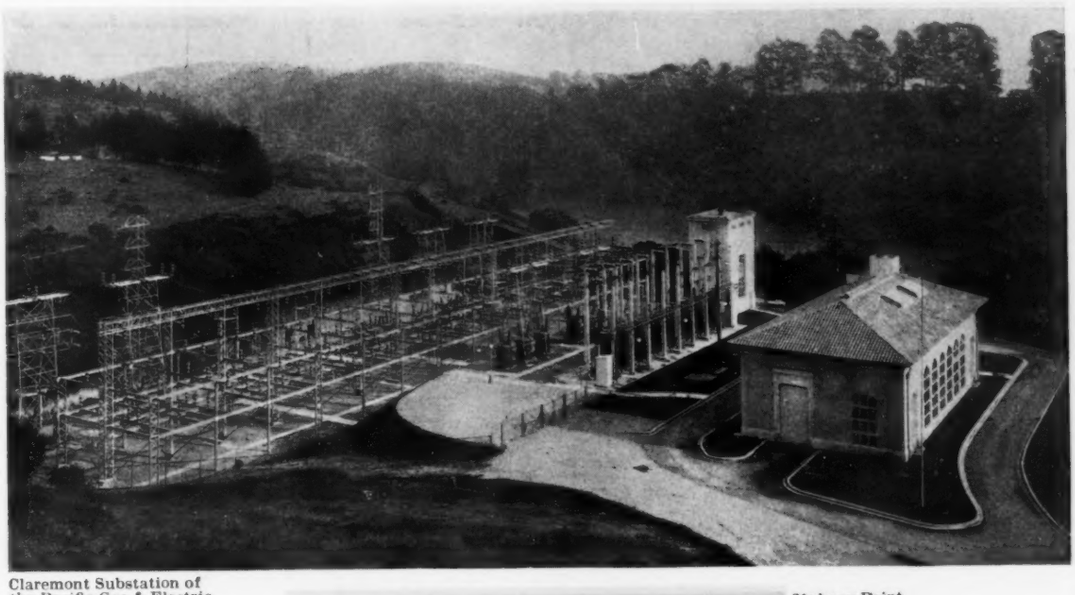




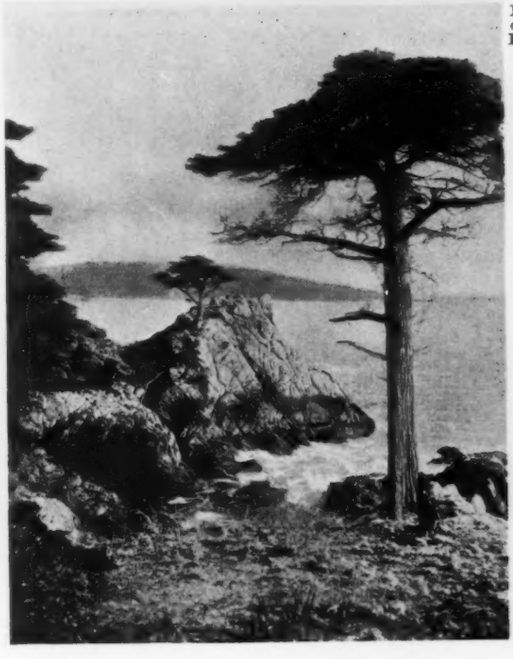
Beautiful Pit No. 1 Power House of the Pacific Gas & Electric Company



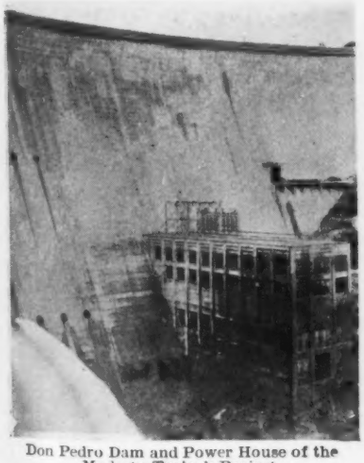
O'Shaughnessy Dam on the Hetch Hetchy Water and Power Project of the City of San Francisco



Claremont Substation of the Pacific Gas & Electric Unites Beauty with Utility

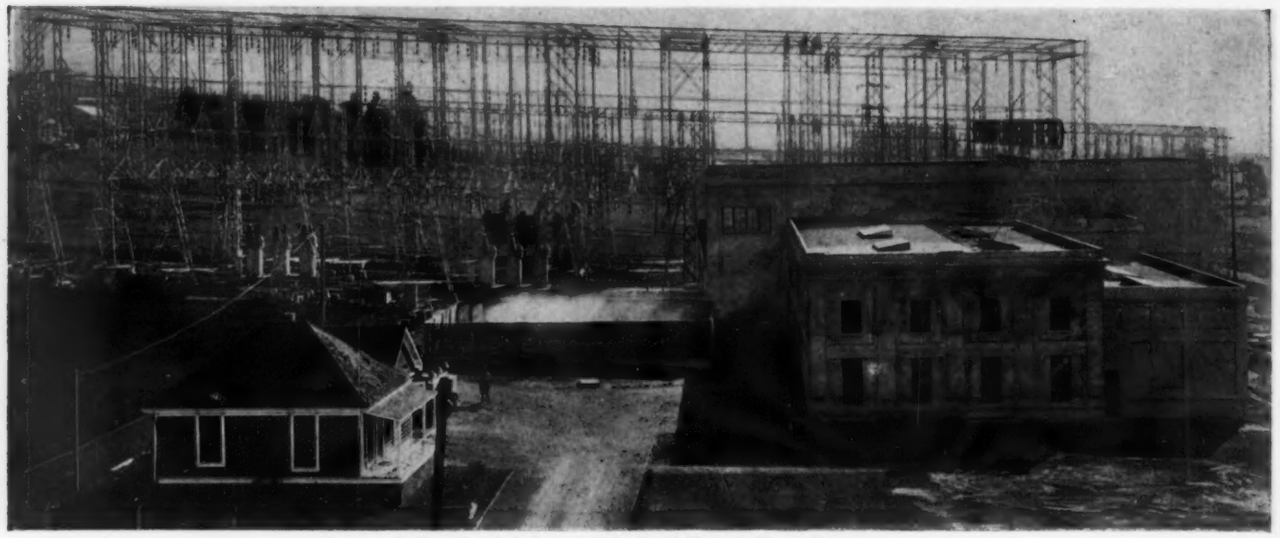


Midway Point on Monterey Peninsula

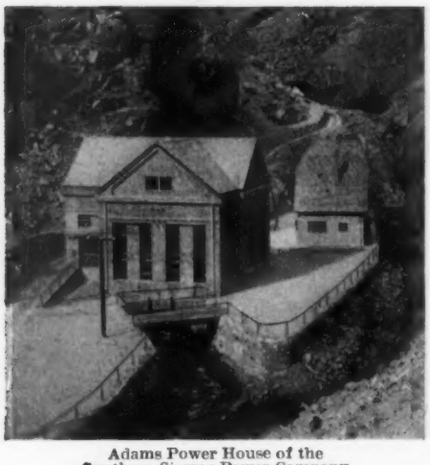


Don Pedro Dam and Power House of the Modesto-Turlock Project

New Headquarters Building of the Pacific Gas & Electric Company

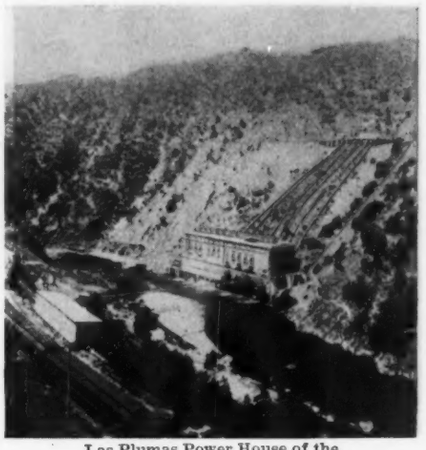


Golden Gate Substation of the Great Western Power Company

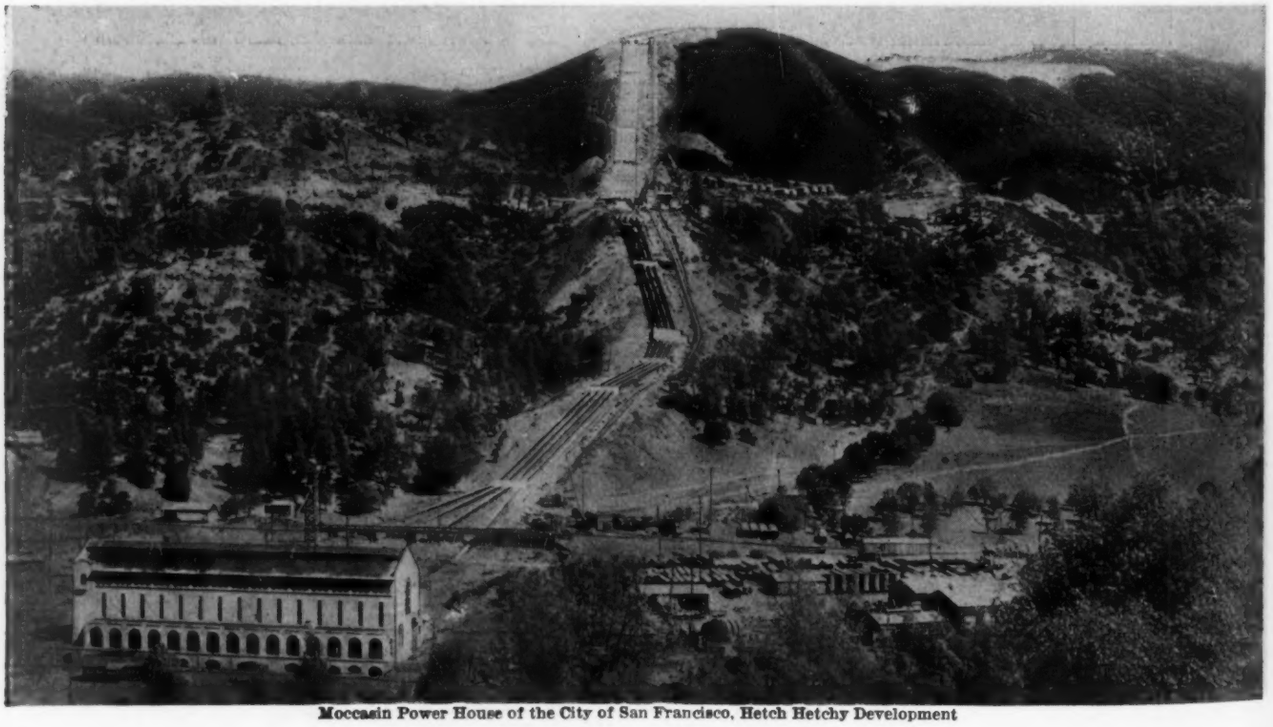


Adams Power House of the
Southern Sierras Power Company

Hydraulic developments are made frequently to serve irrigation, water supply and power needs. Large substations receive the incoming energy from the high-voltage lines and transform and distribute it for use



Las Plumas Power House of the
Great Western Power Company



Moccasin Power House of the City of San Francisco, Hetch Hetchy Development

Looking Down
Market Street

San Francisco
from Nob Hill

The Civic Center of San Francisco,
Where the N.E.L.A. Sessions Are Held

In San Francisco

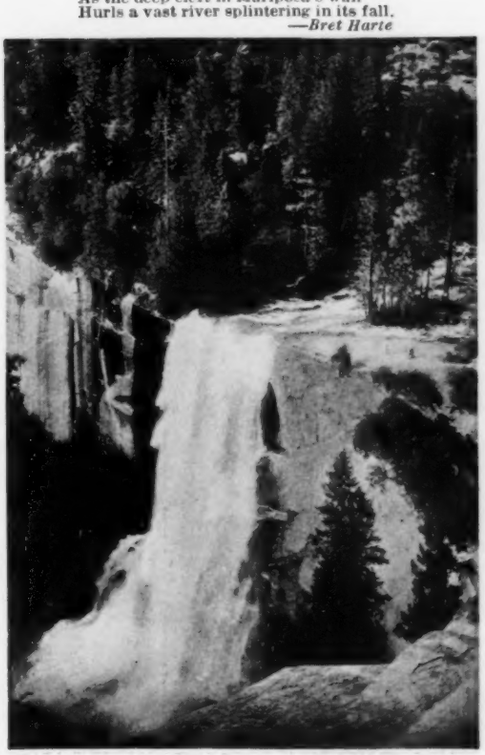
Lo! Here sit we
mid the sundown seas
And the white Sierras.
The swift, sweet breeze
Is about us here,
and a sky so fair
Is bending above
in its azaline hue
That you gaze and you
gaze in delight, and you
See God and the portals
of Heaven there . . . .

Yea, here sit we
by the Golden Gate,
Not demanding much,
but inviting you all,
Nor publishing loud,
but daring to wait
And great in much
that the days deem small.

— JOAQUIN MILLER

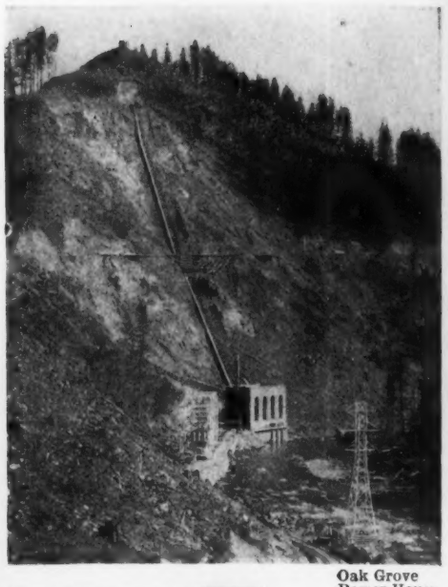
As the deep cleft in Mariposa's wall
Hurls a vast river splintering in its fall.
—*Bret Harte*

The rivers rush upon the
brink and leap
From out the clouds three
thousand feet below,
And land afoam in tops of
firs that grow
Against your river's rim.
—*Joaquin Miller*



Through the Northwest the broad Columbia River rolls for 1,400 miles, forming with the adjacent snow-capped mountains a magnificent scene.

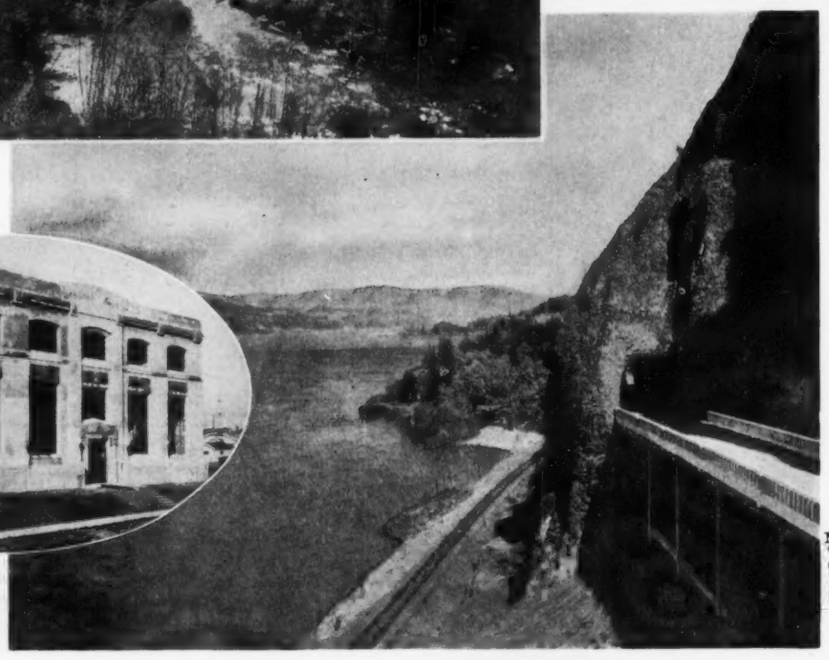
I hear the clear Columbian waters run,
I see the white Pacific flash and flow
Below the swaying cedar trees that grow
On peaks pre-eminent. —JOAQUIN MILLER



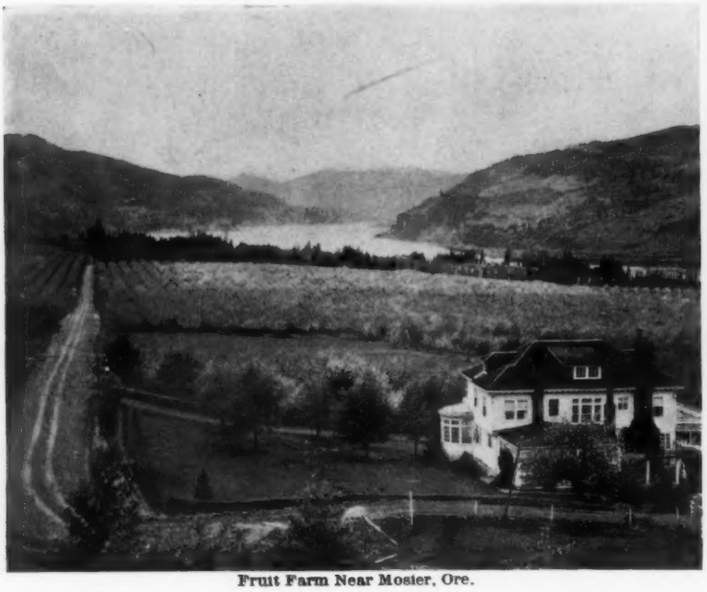
Oak Grove Power House of Portland Electric Power Company

Powerdale Station of the Pacific Power & Light Company

North Skagit Substation in Seattle, Rated at 50,000 Hp.



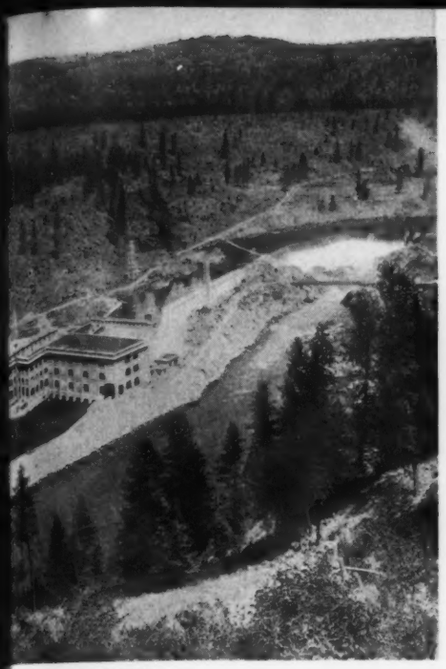
Mitchell Point Tunnel on Columbia River Highway



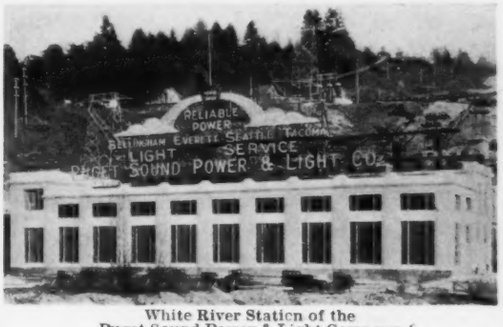
Fruit Farm Near Mosier, Ore.

Baker River Site of Puget Sound Power & Light Company

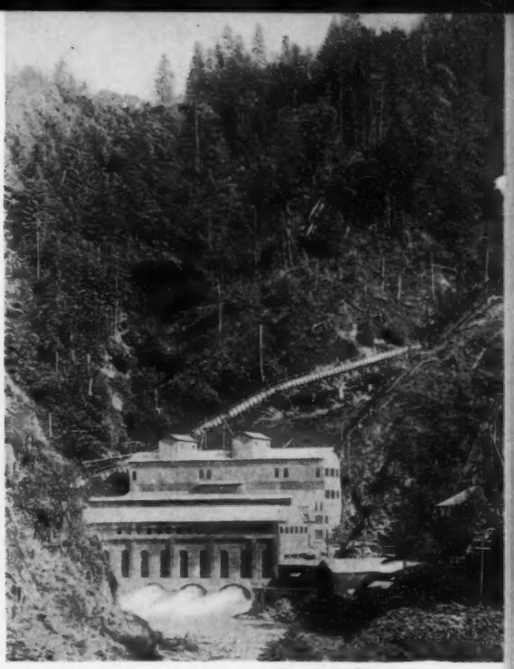
Snow-capped mountains, fertile valleys, numerous rivers and large timber resources make the Northwest a land of beauty and plenty



Little Falls Plant of the Washington Water Power Company



White River Station of the Puget Sound Power & Light Company

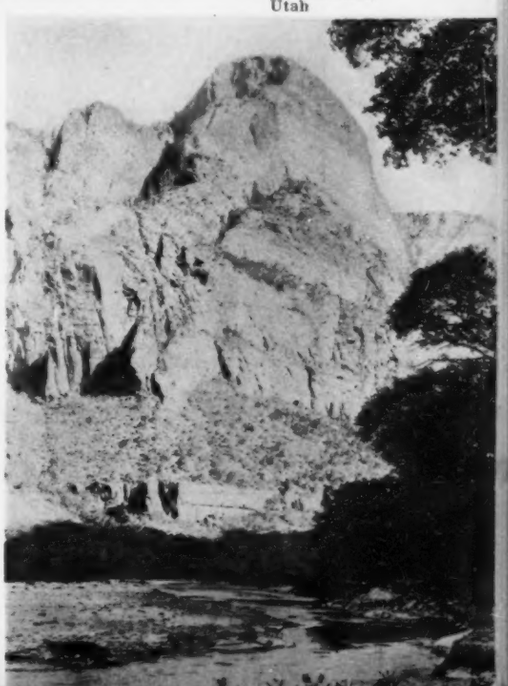


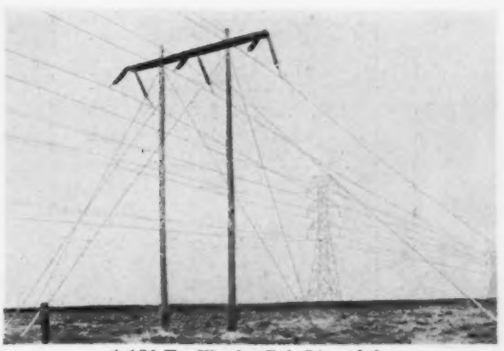
Puyallup River Station of the Puget Sound Power & Light Company

The Long Lake Dam of the Washington Water Power Company is one of the two highest spillway dams in the world

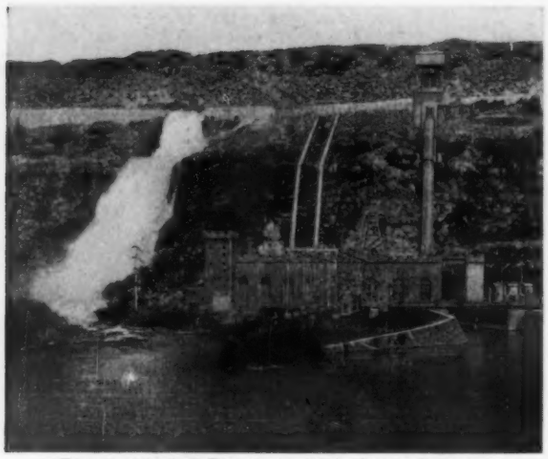
The Spokane River at Post Falls, Idaho

The Great White Throne in Zion Canyon, Utah

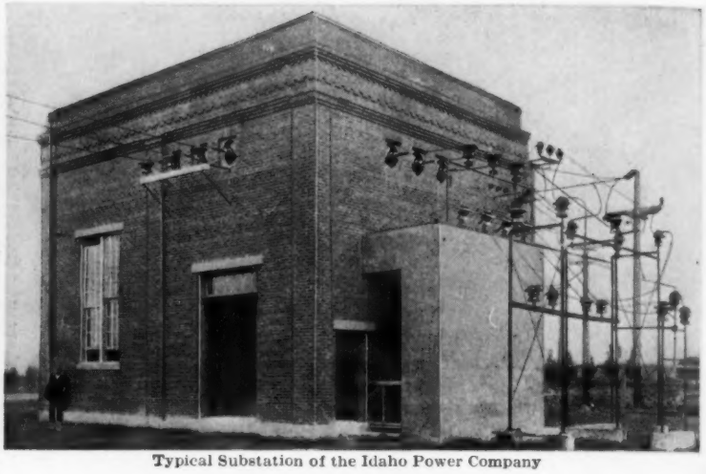




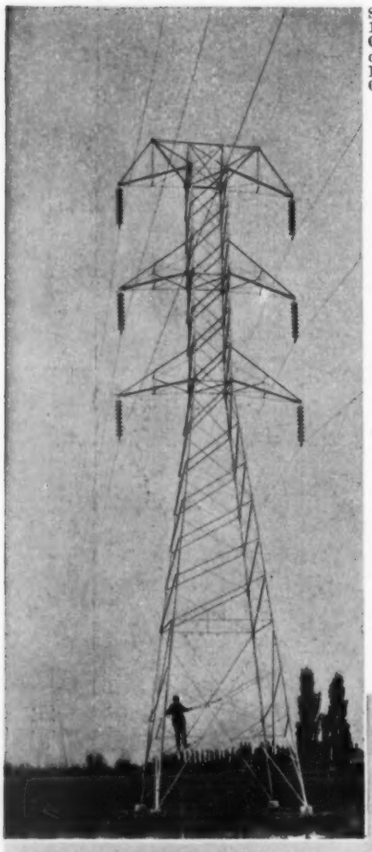
A 130-Kv. Wooden-Pole Line of the Utah Power & Light Company



Thousand Springs Plant of the Idaho Power Company



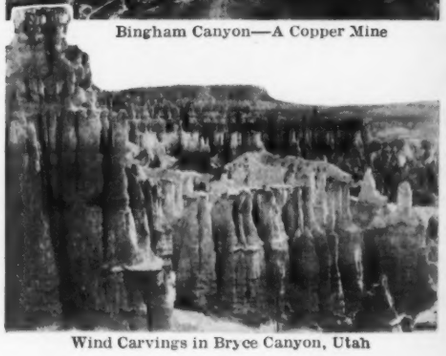
Typical Substation of the Idaho Power Company



Standard 130,000-Volt Construction of the Utah Power & Light Company

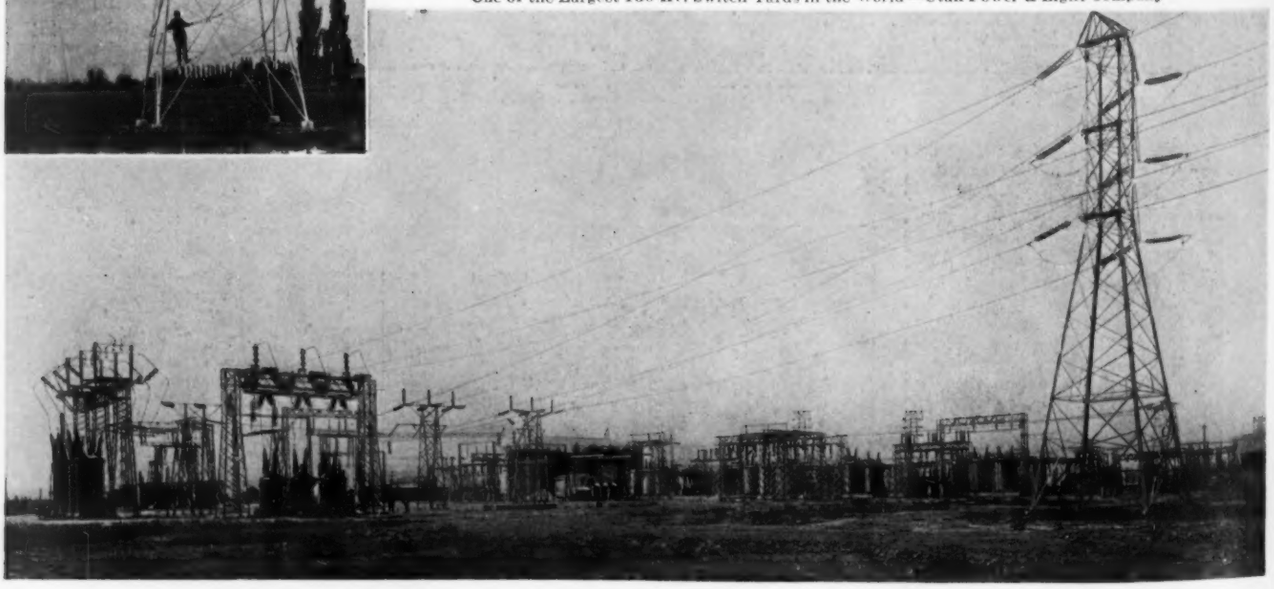
In Utah and Idaho mountains and canyons abound and electric power and irrigation have been used to make possible one of the greatest pioneering developments of history

Bingham Canyon—A Copper Mine



Wind Carvings in Bryce Canyon, Utah

One of the Largest 130-Kv. Switch Yards in the World—Utah Power & Light Company



The scenic grandeurs of Utah and Montana are scarcely more wonderful than the great feats man has accomplished in reclaiming the fertile plains by using water for irrigation and power. Mountains, plains, lakes and canyons offer all varieties of scenery, and the fertile valleys and splendid cities are man-made oases which add to the attractiveness of the territory

A High-Head Plant of the Idaho Power Company

The great Shoshone Falls of the Snake River are 210 ft. high and dwarf the 10,600-kw. plant of the Idaho Power Company

Big Falls of Snake River

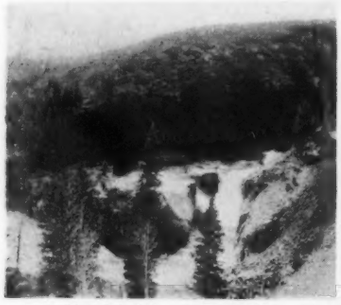
The Salt Lake Plain, with its irrigated farms bordered with poplars, has been reclaimed from the desert.

Utah's mountain roads are matchless in scenic allurement

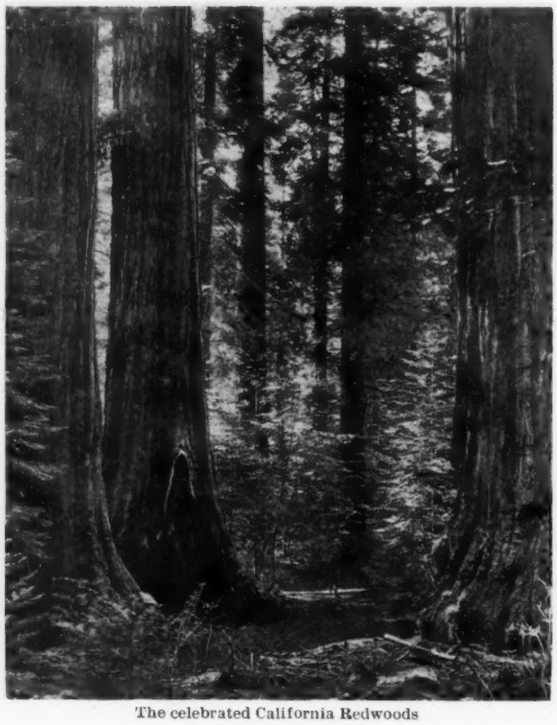
Afar the bright Sierras lie,
A swaying line of snowy white,
A fringe of heaven hung in sight
Against the blue base of the sky.
—*Joaquin Miller*

Scenic wonders which grow greater the more they are gazed upon

Melting snow in the High Sierras is a material asset as well as an added scenic charm

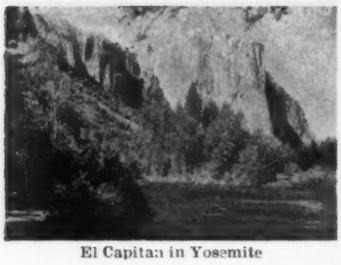


Beautiful Lower Falls of Snake River



The celebrated California Redwoods

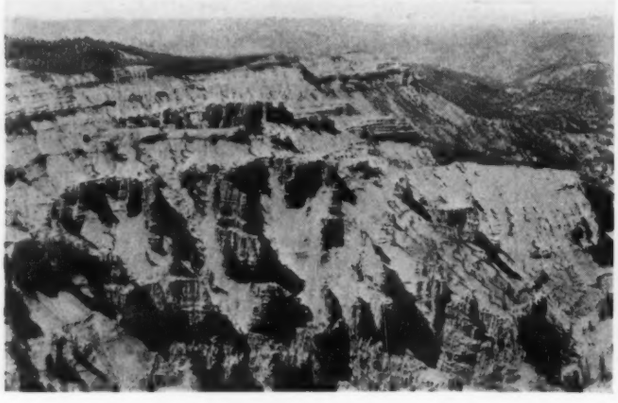
The giant element from rock to rock
leaps with delirious bound.
Crushing the cliffs, which, downward worn and rent
With fierce footsteps, yield in chasms a fearful vent
To the broad column which rolls on.—*Byron.*



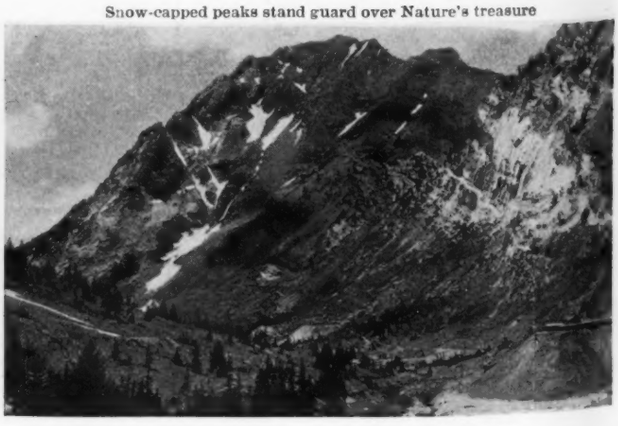
El Capitan in Yosemite

Middle Falls of Snake River

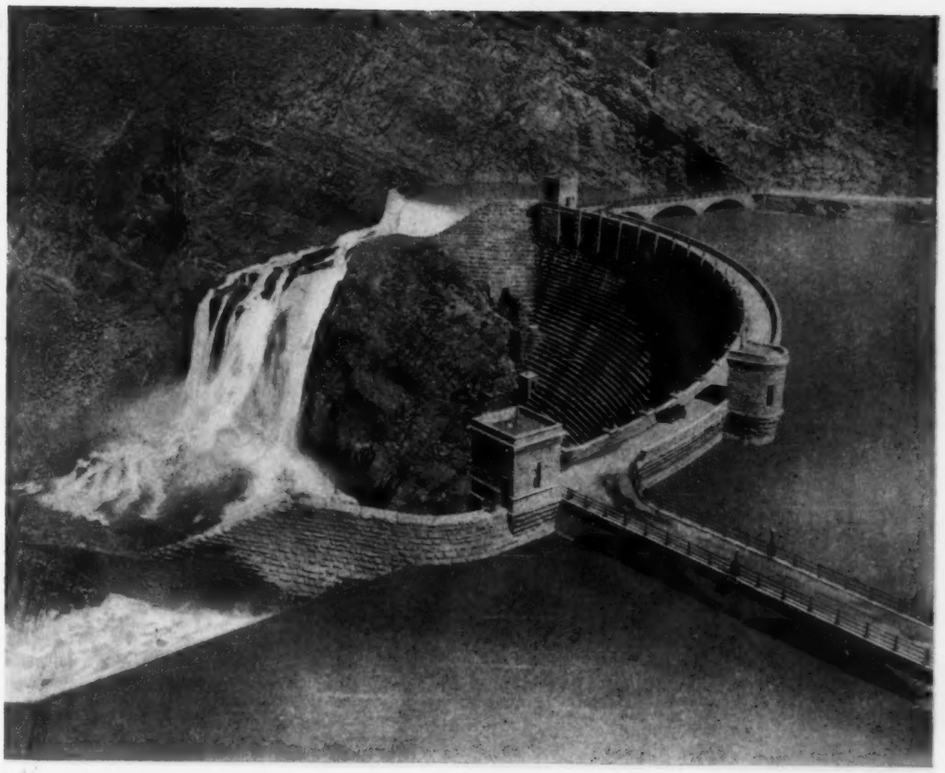
Cedar Breaks is worthy of a more fantastic name



Snow-capped peaks stand guard over Nature's treasure

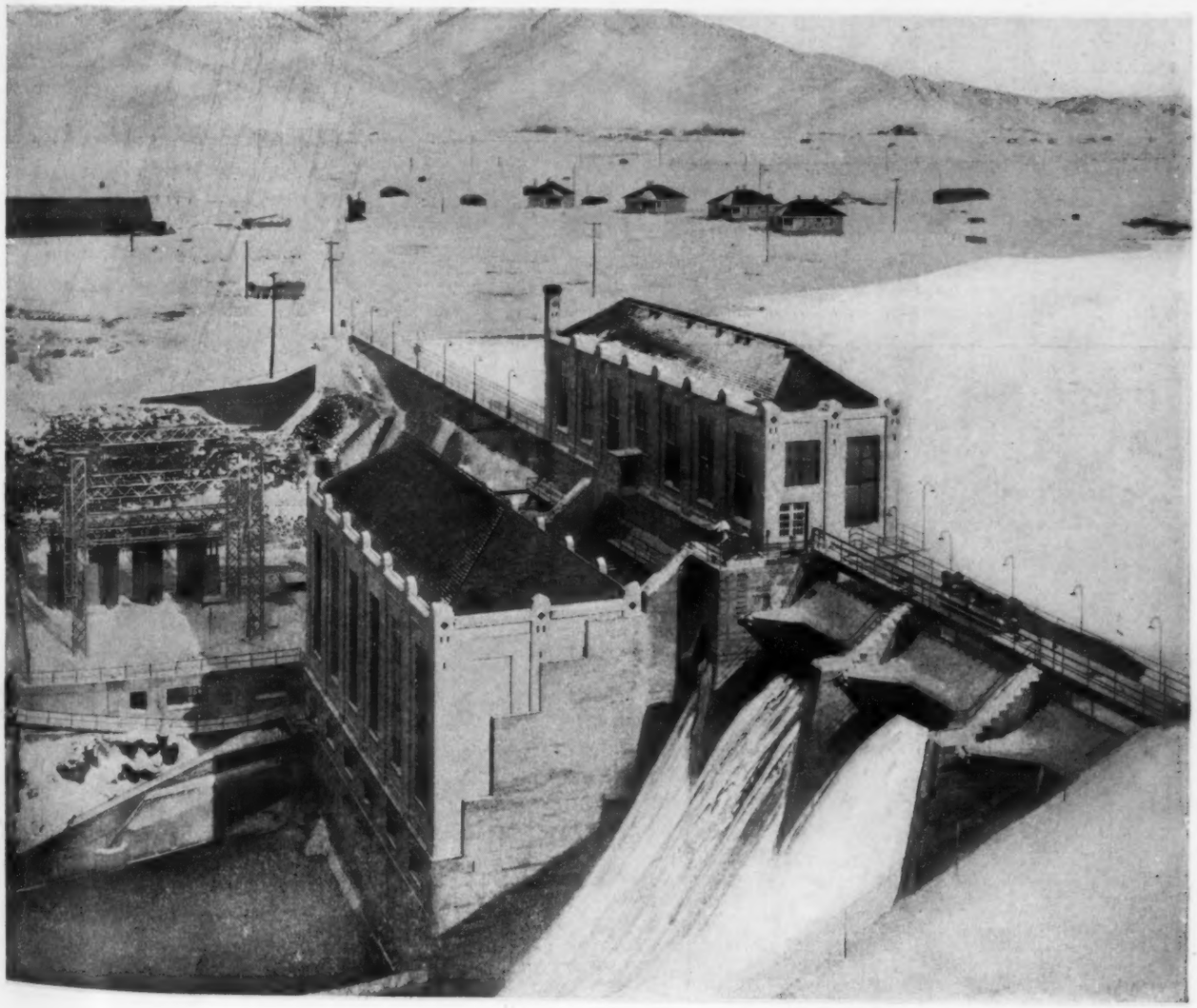


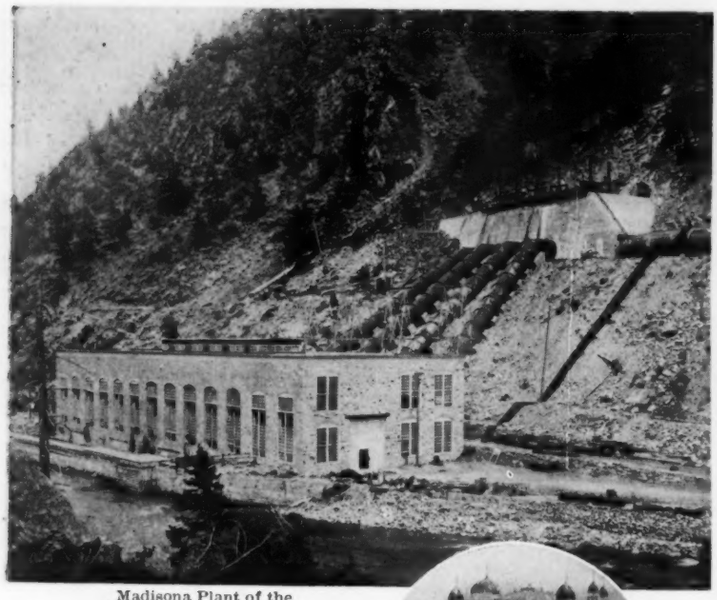
Roosevelt Dam, Salt River Project, Arizona



The feasibility of reclaiming waste land and generating power by means of one development fortunately makes economical many otherwise unprofitable projects in all parts of the West. Both the national government and privately owned power companies have been active in these great projects which bring water and power to the aid of the inhabitants

Station, Dam and Intake of the New Soda Point Plant of the Utah Power & Light Company on Bear River



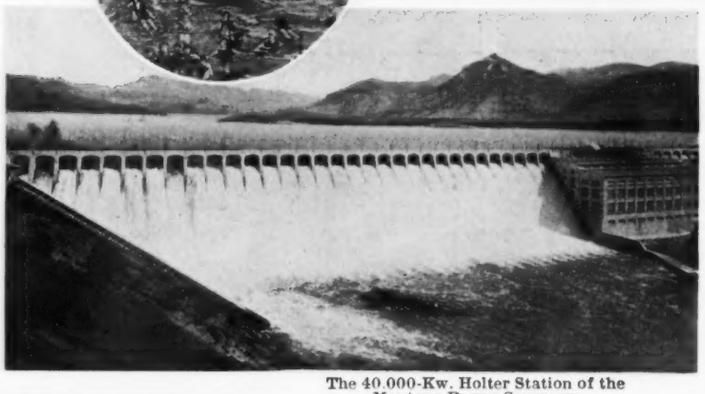


Madisona Plant of the Montana Power Company

Saltair at Salt Lake City

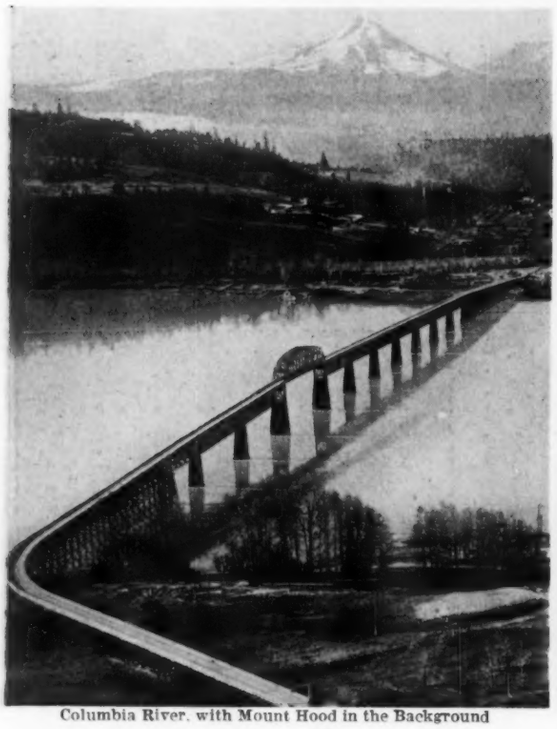
Shalkaho Falls in Montana

Man's achievements add a touch of art to the wonders of nature in many localities

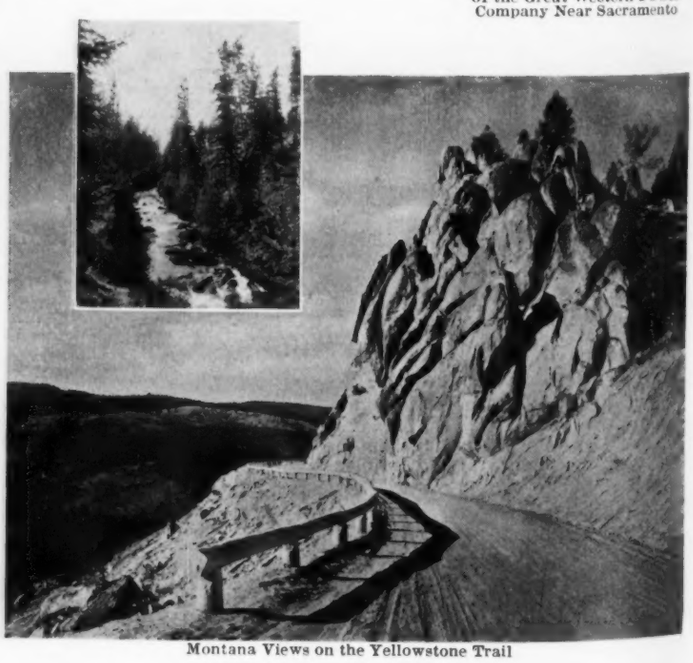


The 40,000-Kw. Holter Station of the Montana Power Company

Standard 165,000-Volt Line of the Great Western Power Company Near Sacramento



Columbia River, with Mount Hood in the Background



Montana Views on the Yellowstone Trail

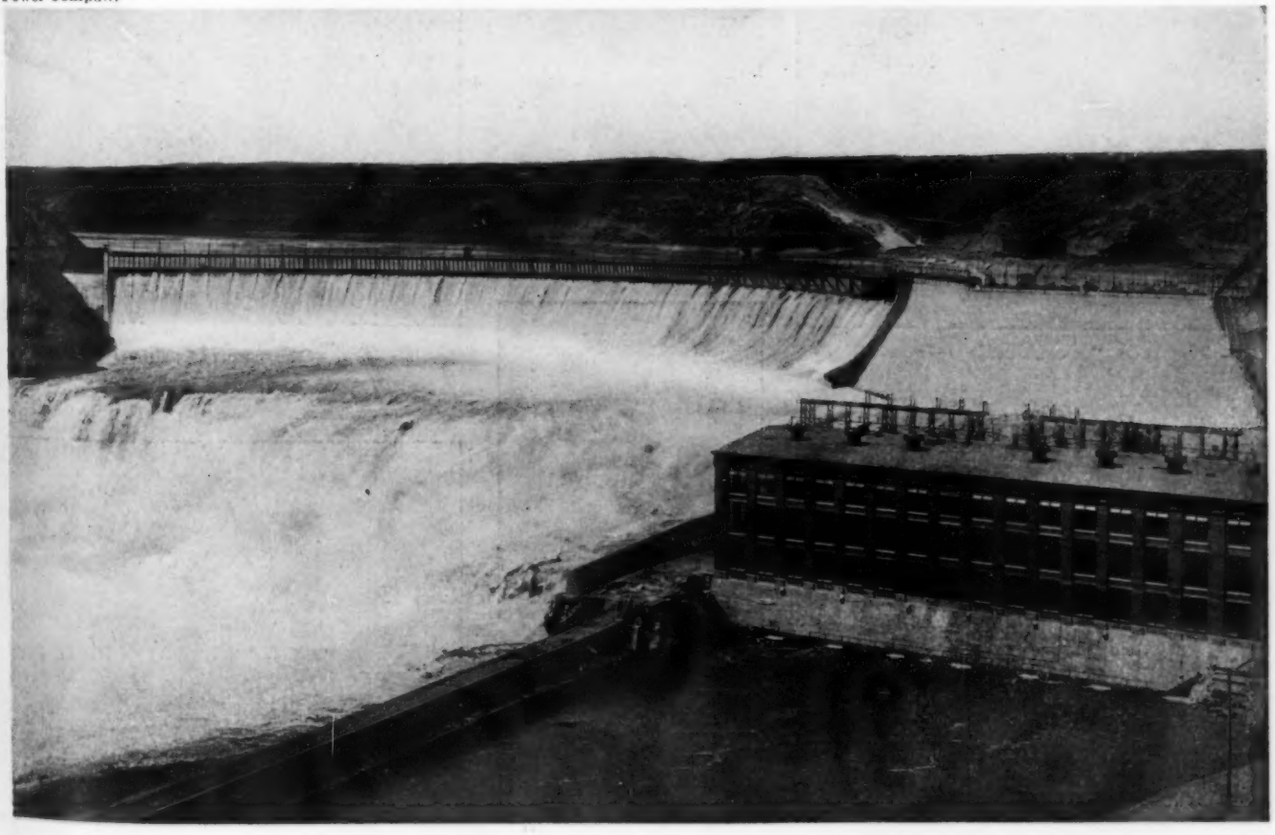
Clark Fork of Columbia River in Montana

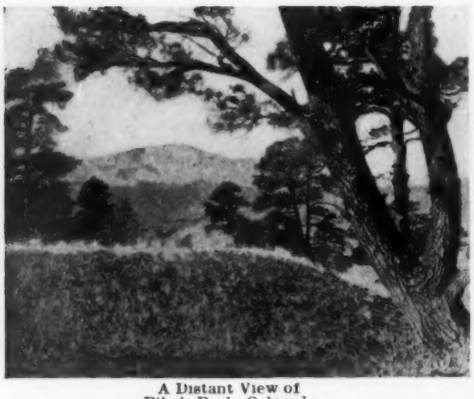
A Site in Madison River, Montana

At right. The Deepwater Steam Plant, Near Houston, Tex.

Below. The Celebrated Great Falls Development of the Montana Power Company

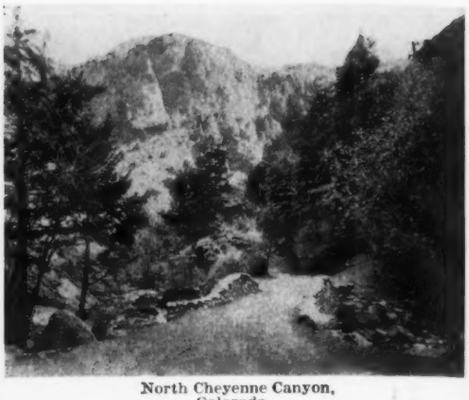
Montana has many undeveloped hydro-electric sites available for use and can rest assured of her future in the sphere of power development. Texas, in the Southwest, on the other hand, has little water power and has built fuel-burning stations to supply power demands



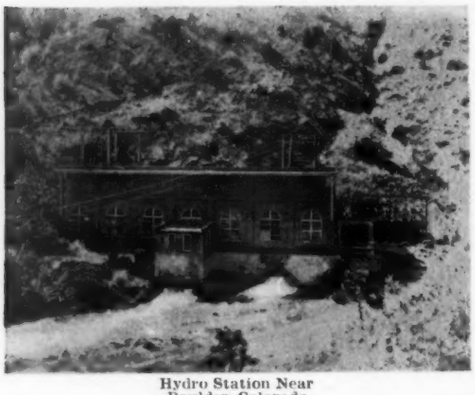


A Distant View of
Pike's Peak, Colorado

Yellowstone Falls,
Wyoming



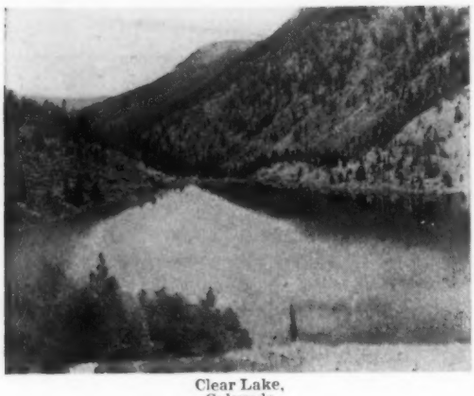
North Cheyenne Canyon,
Colorado



Hydro Station Near
Boulder, Colorado

In the National Parks of Colorado and Wyoming every variety of natural scenery is found. High mountains, deep-colored canyons, geysers, natural bridges, lakes, waterfalls and plains have been brought within easy reach of the tourist through the construction of good roads. In addition many unusually interesting hydro-electric developments utilize the water rushing down from the divides

A Hydro Station on
Shoshone River



Clear Lake,
Colorado

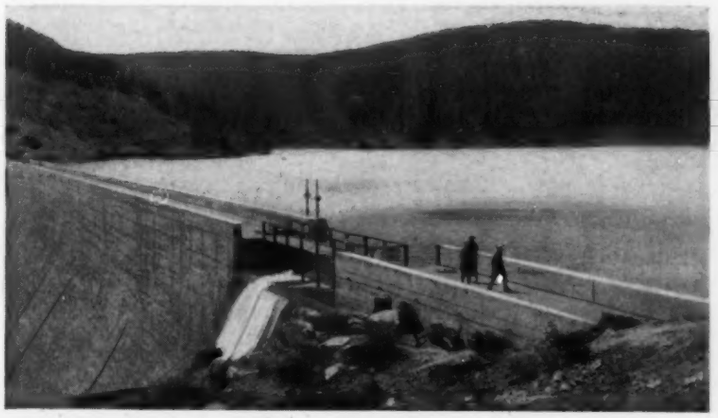
One of the Canyons Near
Colorado Springs

Green Lake,
Colorado

The Garden of the Gods, Colorado

Koster Lake Reservoir

Colorado has many small streams whose flow is very variable. This necessitates storage reservoirs in the canyons to control water flow for power and irrigation. The Nederland Dam in Boulder Canyon is a typical reservoir and control installation.



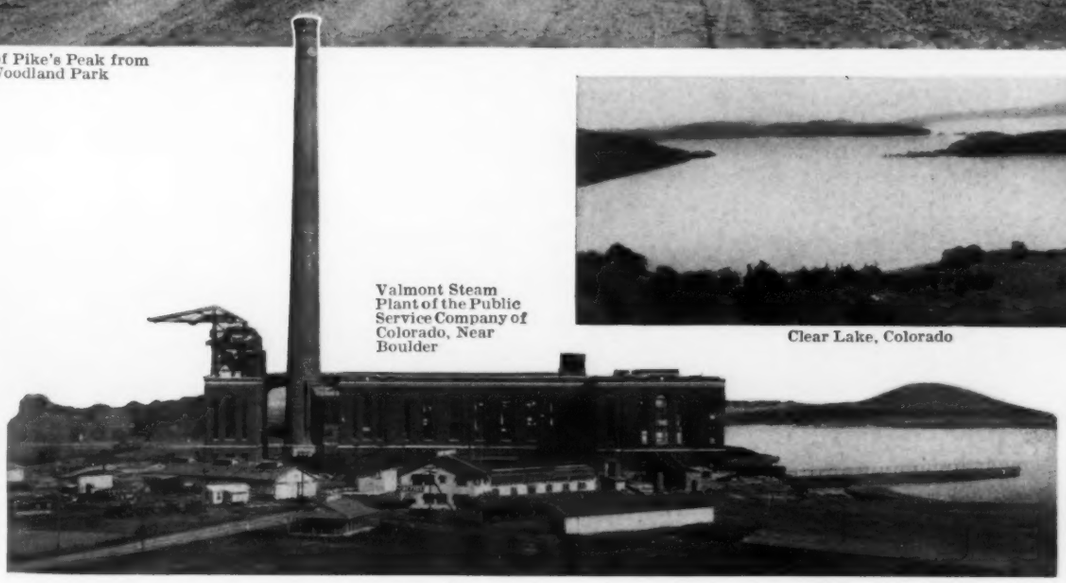
My Dian of the sparkling West,
My lady of the silver bow!
Here, where the savage man made quest
For golden spoils in Earth that grow,
She leads the Golden Age below.

—THOMAS LAKE HARRIS

View of Pike's Peak from Woodland Park

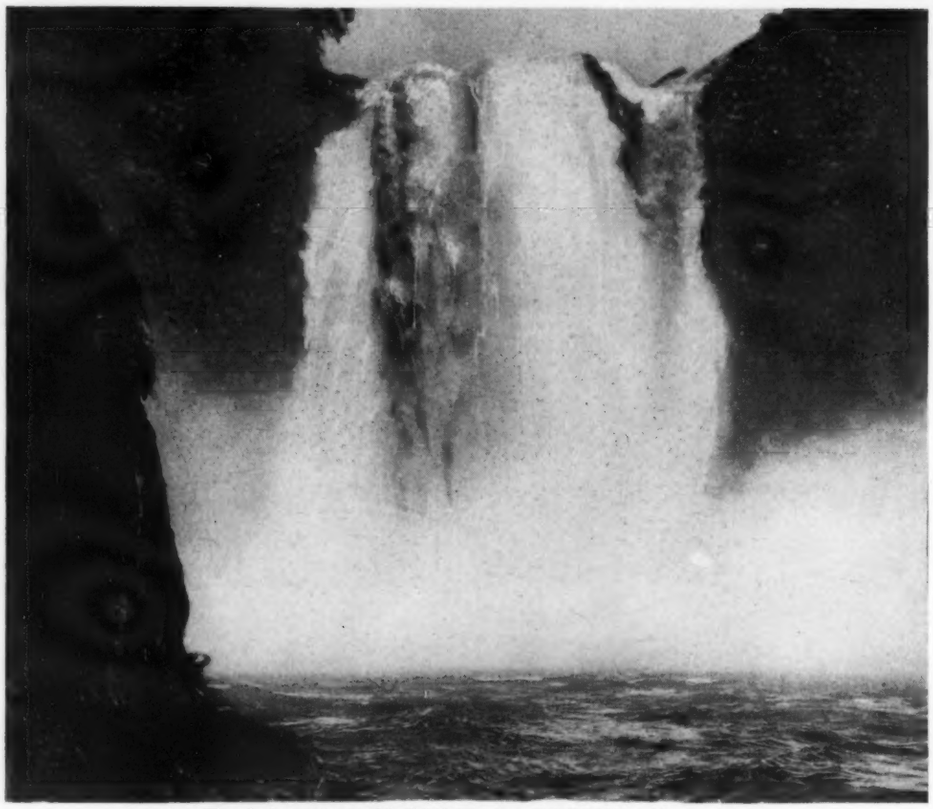
Clear Lake, Colorado

Valmont Steam Plant of the Public Service Company of Colorado, Near Boulder



Mount Rainier

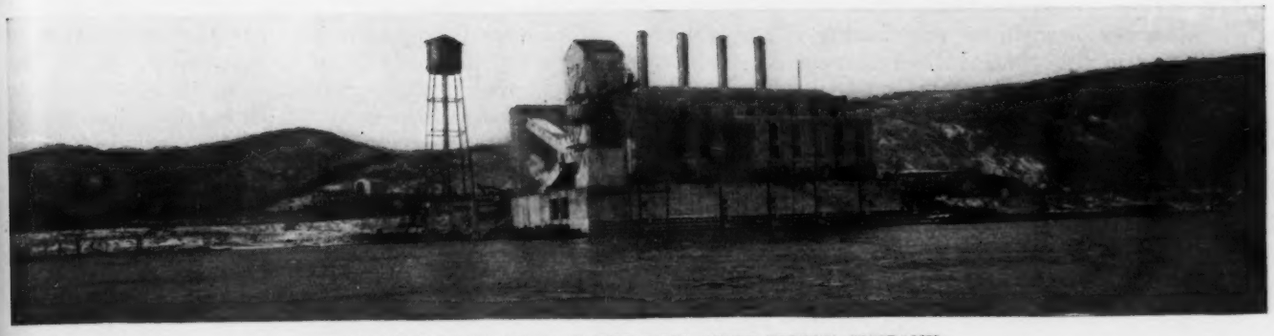
Out of the forest at last there stood the mountain, wholly unveiled, awful in bulk and majesty, filling all the view like a separate, newborn world, yet withal so fine and so beautiful it might well fire the dullest observer to desperate enthusiasm. Long we gazed in silent admiration, buried in tall daisies and anemones by the side of a snowbank. — JOHN MUIR, *An Ascent of Mount Rainier.*



Snoqualmie Fall

The main Snoqualmie Fall plunges over a sheer precipice, about 240 feet high, into a pool seventy-five or eighty yards in diameter. The depth of this pool is shown by the radiating, well-beaten foam and mist, which is of a beautiful rose color at times, of exquisite fineness of tone, and by the heavy waves that lash the rocks in front of it. — JOHN MUIR, *People and Towns of Puget Sound.*

The photographs used in this insert were supplied through the courtesy of the Western power companies, the Union Pacific System, the Oregon Short Line Railroad, and Western photographers



SUPER-POWER STATION OF THE OHIO RIVER EDISON COMPANY

This new plant at Toronto, Ohio, uses no main buses but sends its energy into a high-tension transmission system. The initial installation consists of two 33,000-kw. units operating at 375 lb. pressure and using steam at 707 deg. F. Pulverized fuel and air preheating are used and some very novel arrangements have been installed to produce the heat balance control.

The Engineer in Central-Station Development

By H. P. Liversidge

Vice-President the Philadelphia Electric Company
Chairman National Technical Section, N.E.L.A.

Early Work Largely Design and Construction—Developments Tending Toward Refinements in Economics of Construction and Operation—Engineers Must Direct Attention to Management Problems

THE history of central-station service, brief as it is in comparison with other modern industrial developments, has from its very inception been marked by a succession of achievements in every branch of scientific research and engineering, noteworthy not only because of the initiative displayed but also because of the success in their practical application.

During the early years of development the major problems were almost solely of an engineering nature, and there is little difficulty in visualizing the engineer's part in this period of growth. With the increasing complexity of our modern organizations and their vitally essential financial and commercial issues, the relative importance of the component activities is far more difficult, if not impossible, to define. However, there is little need to be concerned with any such comparisons; rather, we are more interested as individual groups in a survey of our own activities that the part each takes in the big program ahead may accomplish the maximum result.

In order that we may have a clearer vision of the possibilities in the future, it may help if we pause long enough for a backward glance over the road that has thus far been traveled in the advancement of the industry.

During the earlier period of growth—in fact, well into the last decade—the main issue to which of necessity the engineer was forced to devote his attention was the creation of facilities capable of satisfactorily supplying the rapid increase in demand for electrical energy. While the record of growth shows a consistent improvement in economies of construction and operation, these betterments to a considerable extent were due not so much to effort directed largely to this end, but rather were the logical sequence to load growth and increase in size of equipment. During this period of development, every step which the engineer was forced to take brought about new problems the solution of which required the exercise of marked initiative and foresight.

In the light of our present knowledge and experience in central-station engineering, it is not difficult to realize the handicaps that encompassed the engineer in the first decade of central-station progress. Not only was the generating plant equipment very rudimentary, but even greater obstacles were presented in the proper control, regulation and distribution of the energy produced. It is to be said to the credit of those who were pioneers in the establishments of these earlier systems that in spite of such handicaps the solution of the many intricate problems anticipated every requirement for reliable and economic service.

With the advent of the alternating-current system, the engineer had at his command facilities for the generation and transmission of electrical energy which presented entirely new opportunities, and again the industry faced a new and untried field of even greater difficulties and responsibilities. The history of this development, which covers a brief period of little more than two decades, will always stand out as a most interesting chapter in the annals of central-station growth. It is in this period that the greatest strides have been

made in every branch of engineering. The prime movers, first direct-connected to reciprocating engines, rapidly increased from a few hundred kilowatts to about 7,500 kw. in capacity; and then with startling rapidity the steam turbine revolutionized our practices in power generation, with the result that in a period of but a few years the capacity of generating units has grown from a few thousand kilowatts to the present rating of 70,000 kva. During this period the capacity of boilers has increased more than five times and steam pressures have been raised in practically the same ratio.

Similarly, marked strides were made in the control of the electrical energy, with the result that switching equipment, which a few years ago interrupted rather unsatisfactorily a few thousand kilovolt-amperes, is now successfully rupturing capacities of 1,500,000 arc kilovolt-amperes.

Paralleling these developments there has been a consequent advance in methods and facilities for the transmission, conversion and distribution of these great blocks of power; and while the early attention to this phase of central-station service undoubtedly lagged for a period of years, we are today able to record the practical operation of aërial transmission lines of 220,000 volts and underground cables satisfactorily operating at 66,000 volts.

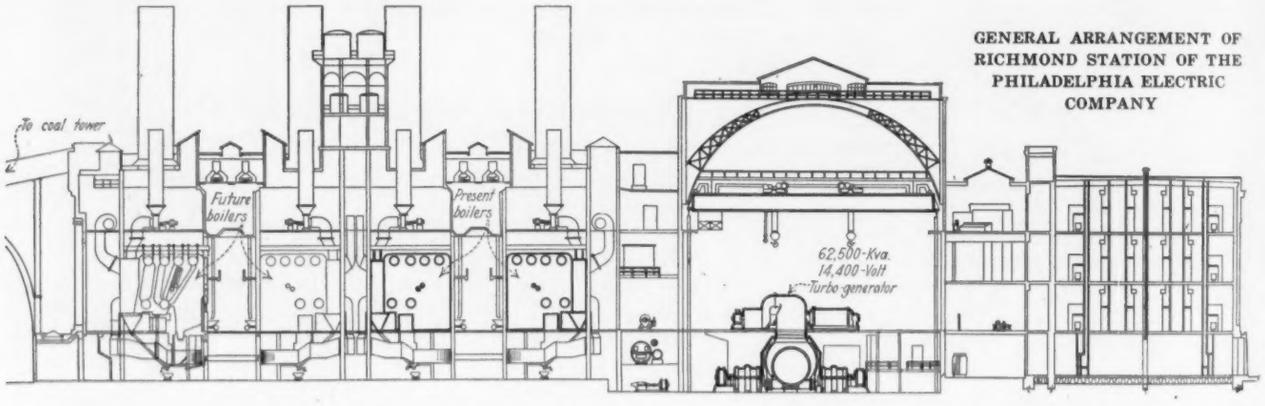
During this period of expansion, and particularly at the time immediately preceding the introduction of alternating-current systems, limitations in size of generating plants as well as distribution equipment presented a number of difficulties to the further growth of the business. The limitations in radius of distribution pointed to the establishment of additional generating centers as the only practical means of solution. With the impossibility of transmitting even reasonable amounts of power between the different plants, however, and the necessity for their location to suit the restricted areas of distribution, such development offered little if any possibilities for improved economies.

With the advent of alternating current for generation and transmission, and the consequent increase in transmission voltages, most of the serious restrictions that faced the engineer in increasing the number of plants were eliminated. New stations could be established at locations offering maximum facilities for economical production of energy and, in addition, interconnection of these plants still further increased the opportunity for savings, so that the limitations inherent in the early development were almost entirely removed.

If now we take a survey of our present position in relation to the growth of the industry, it will be apparent that in many respects conditions are entirely different. It is evident that with the facilities now at our command we are going through a period in which developments tending toward marked refinements in economies of construction and operation are taking the center of the stage. These improvements, which apply to all parts of the physical plant, in many instances are effecting radical changes in existing practice.

In the generating plant, the use of the regenerative cycle, with reheating, preheating of air to the boilers, increase in steam pressures to 1,200 lb. and temperatures up to 750 deg.—these steps as well as numerous minor innovations have all been rapidly brought about with a view toward increased economies of production. Coupled with this development, rapid strides have been made in the more efficient firing of coal, and the use of pulverized fuel has established results that have proved most satisfactory in major installations under variable coal conditions and widely varying load characteristics.

In the hydro-electric field the development of the turbine in particular has resulted in increasing capacities to a present maximum of 70,000 hp.; speeds have increased more than double, and the efficiency of the units has been raised to a value of approximately 94 per cent.



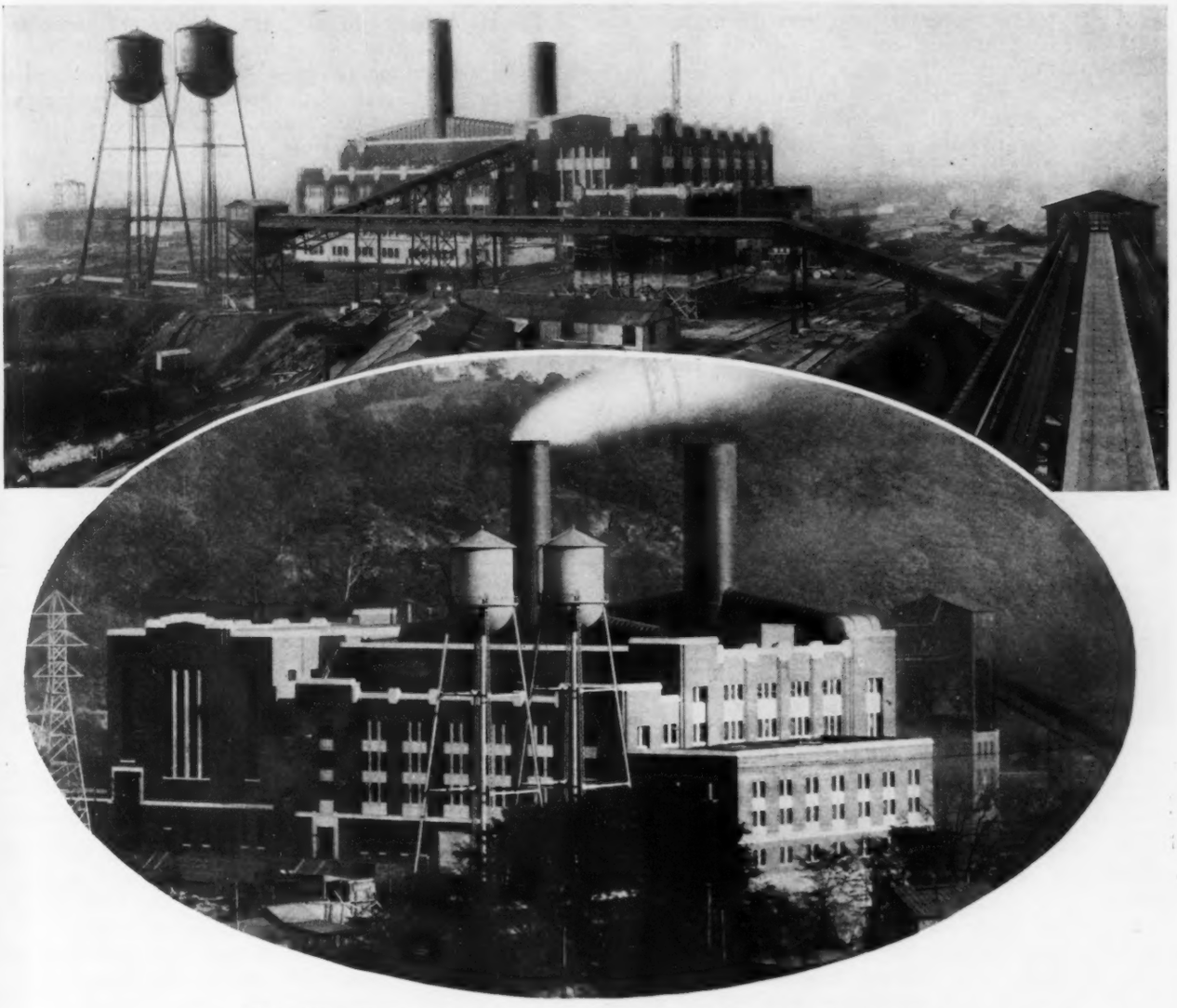
GENERAL ARRANGEMENT OF RICHMOND STATION OF THE PHILADELPHIA ELECTRIC COMPANY

Paralleling these improvements, steady progress is being made in the further interconnection of generating plants and systems, and these combinations of both hydro-electric and steam stations have enabled the industry to take greater advantage of the economies to be gained due to varying plant characteristics, load diversity and reduction of spare generating capacity.

It would appear, therefore, that the broad problem to which the engineer is now devoting his attention and to which he will be forced to devote still greater attention in the future is strictly a matter of increased economies in construction and operation, and greater reliability, where possible, in the supply of electric service.

A Sound Foundation Is Available

We have as a basis for our future work a well-developed, reliable and economical system for the generation and distribution of electrical energy. This development, as we have seen, has been the result of intensive research and practical application of sound principles. During this period it was necessary at



Two New Stations of the American Gas & Electric Company

SINCE the first of the year the Philo plant, near Canton, Ohio, and the Twin Branch plant near South Bend, Ind., have been placed in operation. The two plants are identical in general design, each being built for an initial installation of two 40,000-kw. units, with an ultimate capacity of 240,000 kw. They are designed to operate at 600 lb. boiler pressure, and in addition each will have a 500-hp. reheat boiler in the initial installation. Pulverized fuel is used and an operating economy of about 13,900 B.t.u. per kilowatt-hour is reported. These new stations embody many novel design features to secure economy.

every turn to cope with the urgent demands for increased capacity in every detail of our physical equipment. In analyzing the trend of growth for the future, it is quite likely that the necessity for a continuing increase in capacity of equipment will be far less than we have been forced to meet during the past decade.

It has been estimated that the output of the industry will treble within the next ten years. However, it does not necessarily follow that the capacity of generating and distributing equipment will also be trebled. Further increases along these lines will be largely determined by the economics of the situation. If it can be shown that increase in capacity of generating plants or the component parts of these plants, or the increase in capacities of transmission lines, which involves further increase in voltages, will result in lower unit cost of invested capital or increased efficiencies, naturally the engineer must be in a position to meet the issue.

On the other hand, it does not appear that the trend will follow these lines, but rather that our future efforts will be directed largely to increasing economies in construction and operation. Size has always been a most popular measure of accomplishment, however, and in looking ahead it is well to keep in mind that in all probability the yardstick of performance will prove a far more accurate means of comparison.

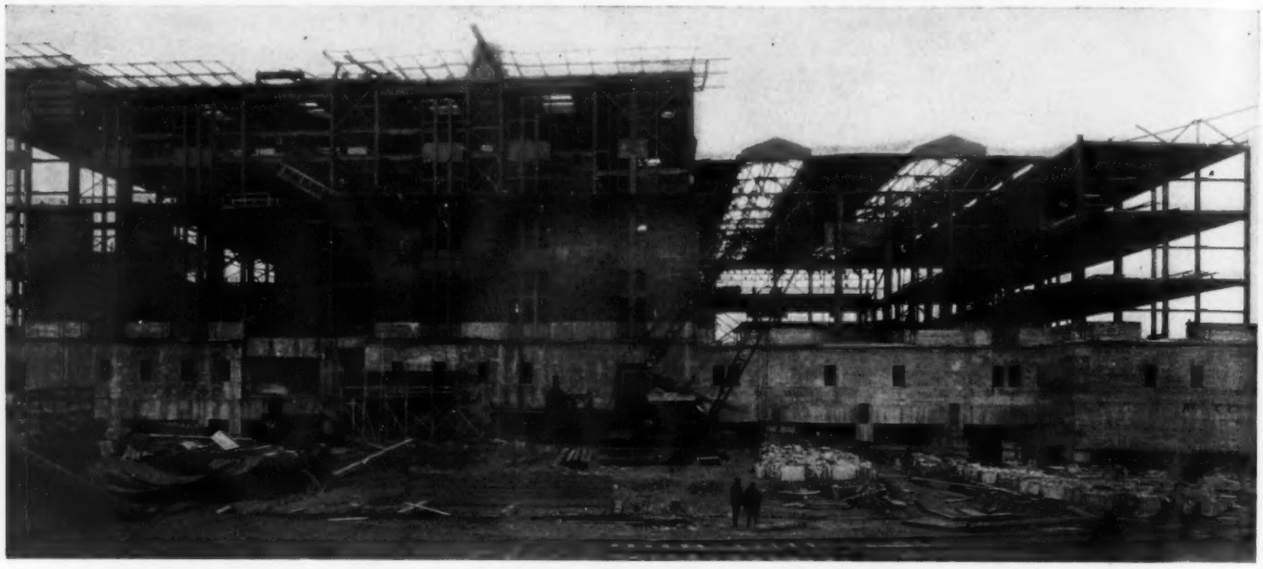
ENGINEERS MUST AID IN MANAGEMENT

If, therefore, this viewpoint is correct, the engineer should clearly recognize the situation. In order successfully to fulfill the responsibilities for which his training logically fits him he must direct his attention more and more toward the broad problems of management.

Unfortunately, in the stress of intensive application to one phase or another of our work, engineers as well as others are often prone to exaggerate the importance of their particular duties, with the result that development tends toward narrower lines of specialization, and the usefulness of the individual is restricted accord-

ingly. If the engineer is satisfactorily to meet the situation ahead, he must combine not only his ability as a trained technician but must in practice apply such knowledge that the result may be sound from an economic standpoint. His activities must be directed specifically toward greater conservation in the use of new capital, greater use of existing investment and

The management of our physical property, therefore, and the relation of the engineer to every activity in its future operation and expansion, must be the keynote directing our efforts in the future. In accepting this broader viewpoint, which the engineer specializing in central station work must surely recognize, we are not relieved in any degree of the necessity for con-



MIAMI FORT STATION OF COLUMBIA POWER COMPANY

The initial installation will consist of two 40,000-kw. tandem units operating at 550 lb. pressure with steam at 750 deg. F. Pulverized fuel is used and steam reheating is practiced. The full-load water rate of the turbine is expected to be 7.67 lb. per kilowatt-hour. The new station will supply energy to a big interconnected system located in the adjacent territory.

greater economies in the turnover of every dollar required for production and distribution of electrical energy.

Satisfactory progress is dependent largely on the character of service and the price at which such service can be supplied. Our business development, therefore, and the success of commercial activities will of necessity be greatly influenced by the results of the engineer. If the rate of growth is to be maintained for the future, our commercial interests must be able successfully to meet keener competition in certain classes of industrial business; and while this is only one phase of the situation, it should be clearly recognized that results will be greatly influenced by the degree to which both commercial and engineering efforts are co-ordinated.

If we turn to the question of satisfactory financing, we also must recognize that these problems will be materially affected by the results of engineering management. It is hardly necessary to comment on the fact that capital requirements for plant extensions are secured most readily and at minimum cost when the record of performance tells a plain story to investors. Just so long as the management of our industry is directed toward the most careful and productive use of every dollar for plant extensions and the production and distribution of energy is accomplished at the least possible cost, the future is satisfactorily assured. Extravagant extensions to plant or careless methods in generation and supply are certain to bring about serious conditions. Today the electric light and power industry is recognized as a sound investment. It will maintain this position just so long as the results continue to justify this confidence.

tinued progress in the purely technical fields of endeavor. In the last analysis this has always been, and undoubtedly will continue to be, the fundamental base on which all permanent advancement rests.

Efficiencies of production, transmission and distribution still present great opportunities for improvement. In the field of generation, we have developments in the foreground which if they can be applied successfully to our future program will show a still further reduction in the cost of producing power. The mercury boiler, low-temperature distillation of coal and the use of steam pressures approaching the ultimate of 3,200 lb.—all these developments, even with our limited knowledge and experience, give evidence of far-reaching possibilities in their future application.

The interconnection of plants and systems which is today being carried forward quite rapidly offers further possibilities for improved economies in both investment and operating costs. Here again there is the necessity for extensive study in order that the maximum results may be obtained from such interconnections. There is still much to be learned regarding the theory and practical technique of operation of such combinations so that the inherent advantages will not be even partly offset by the complications due to dissimilar plant characteristics and energy demands.

In the distribution of energy there is also opportunity for marked improvement. Greater attention to size and loading of transformers, more economical use of distribution lines and, when possible, the adoption of higher voltages will help materially in minimizing the losses in the delivery of power.

From a strictly engineering viewpoint, there is cer-

tainly a big field ahead for intensive study and application; and if, in addition, the efforts of the engineer are directed even more specifically toward results that can be directly measured in terms of financial and commercial gain, the outcome will likely be of greater value—or, at least, better understood—than if consideration had not been given to all phases of the subject.

The present-day problem, and the one to which our greatest efforts must be directed in the future, therefore, is not by any means a strictly technical one, but rather the performance of every phase of engineering work in a manner that will result in lowest cost for plant extension, energy production and its distribution.

It is not sufficient that we continue to show improvement when such improvement is directly or indirectly due to the development of more efficient apparatus, increase in load or improved load characteristics. As great, if not greater, possibility lies in the savings that can be made when effort is concentrated on conserving every dollar in the management of our industry.

In its broadest aspects, the engineer is particularly well fitted to cope successfully with every phase of activity involved in the management of physical property, and there is every reason for his taking the initiative in such a program. In order that progress may be made in a logical manner, the records of performance expressed in terms of dollars and cents, covering every item of production and distribution, must be known in detail. Greater attention must be given to the establishment of practical budget systems which in their operation will not only provide the necessary records of expenditures but will also serve as a ready means for comparison between carefully estimated performance and actual results. Various systems of budgeting are in use today, but in many cases they fail when applied to the actual performance of work. Effective results along these lines are made possible only when the operation of budget systems elicits the maximum co-operation of every individual in the great body of workers who are qualified by training to produce the results desired. Closer co-ordination of all these factors, increased effort and initiative of the individual, mutual understanding of the responsibilities and aims of the various groups identified with the major problems, all are vitally essential to progress.

In brief, sound management—the effective direction of all these activities—is the keynote of business success. The engineer who has played so important a part in the erection and building of this industry has at his command the knowledge and experience requisite for the successful administration of these broader issues. His future position and the relative importance of his work will be determined largely by the breadth of vision and initiative displayed in furthering the economic growth of the industry.

Good Performance of American Central Stations

AMERICAN power stations have reached a thermal efficiency which is very high. For example: The Colfax plant of the Duquesne Light Company operated for three months in 1925 at an economy of 16,900 B.t.u. per kilowatt-hour with a low week's operation at 16,600 B.t.u. per kilowatt-hour.

The Hartford Electric Light Company has perfected the operation of the mercury-steam boiler plant to obtain a reported test economy of 10,000 B.t.u. per kilowatt-hour.

The Lakeside station of the Milwaukee Electric Railway & Light Company operated at an economy of 15,599 B.t.u. per kilowatt-hour during the first three months of 1925.

The Philo plant of the Ohio Power Company without reheating operated at an economy of 14,315 B.t.u. per kilowatt-hour over a weekly period in April, and under test conditions with steam reheating an economy of about 11,600 B.t.u. was obtained.

The Cahokia station of the Union Electric Light & Power Company in St. Louis operated with an economy of about 16,900 B.t.u. per kilowatt-hour during the first three months of 1925.

The Trenton Channel plant of the Detroit Edison Company has attained an operating economy of 16,000 B.t.u. per kilowatt-hour.

These stations are run under different load and operating conditions, so that direct comparisons are difficult to make, but the general statistics show a great increase in station thermal performance.

NEW CRAWFORD AVENUE STATION OF THE COMMONWEALTH EDISON COMPANY MAY HAVE AN ULTIMATE RATING OF 750,000 KW.

Hydro-Electric Stations Under Construction or Going into Operation 1925-1926

Station	Company	Location	Initial Capacity, Kw.	Date of Operation	Ultimate Capacity, Kw.
Northeastern States					
Soft Maple Dam	Northern New York Utilities	Beaver River near Watertown, N. Y.	20,000	Spring, 1926	30,000
Hawley	Pennsylvania Power & Light	Hawley, Pa	40,000	1926	40,000
Southeastern States					
Terrora	Georgia Railway & Power	Lake Tullulah, Ga	11,250	March, 1925	22,500
Yonah	Georgia Railway & Power	Tullulah River, Ga	25,000	1926–1927	25,000
Nacoochee	Georgia Railway & Power	Tallulah River, Ga	5,000	1926–1927	5,000
Bartlett Ferry	Columbus Electric & Power	Columbus, Ga	30,000	1926–1927	60,000
Rhodhiss	Southern Power Co	Rhodhiss, N. C	33,750	1925	33,750
Catawba	Southern River	Catawba, N. C	60,000	1925	60,000
Rock Island	Tennessee Electric Power	Rock Island, Tenn	16,650*	1925	.....
Muscle Shoals	U. S. Government	Muscle Shoals, Tenn	250,000†	1925	600,000†
Cherokee	Alabama Power Co	Alabama	90,000†	1926	180,000†
Ocoee No. 3	Tennessee Electric Power	Tennessee	30,000†	1928	30,000†
Rocky Creek	Southern Power	Catawba River, N. C	45,000	1925	45,000
Middle Western States					
French Landing	Detroit Edison	Huron River, Mich	2,400	May 1, 1925	2,400
Blanchard Rapids	Minnesota Power & Light	Royalton, Minn	13,500	April, 1925	13,500
Hodenpyl	Consumers Power Co	Manistee River, Mich	18,000	Aug., 1925	18,000
Oakdale	Indiana Hydro-Electric	Monticello, Ind	10,500	June, 1925	10,500
Licking River	Kentucky Northern Power	Falmouth, Ky	27,000	1927	27,000
Gasconade	Central Missouri Power & Water	Gasconade River, Mo	30,000	1926	30,000
Caldron Falls	Wisconsin Public Service	Caldron Falls, Wis	9,300†	1925	9,300†
Dix Dam	Kentucky Hydro-Electric	Dix Dam, Ky	36,000†	1925	36,000†
Pacific Coast and Mountain States					
Buck's Creek	Feather River Power Co	Middle Fork, Feather River, Cal	37,500	?	300,000
Balch	San Joaquin Light & Power	Kings River, Cal	28,250	Dec., 1926	146,000
Bear River	Utah Power & Light	Logan, Utah	30,000	?	.....
Pit River No. 3	Pacific Gas & Electric	Pit River, Cal	75,000	July, 1925	75,000
White River	Puget Sound Power & Light	Dieringer, Wash	15,000*	Jan., 1925	.....
Exchequer	Merced Irrigation District	Merced, Cal	30,000†	?	30,000†
Copco No. 2	California Oregon Power	Klamath River, Ore	30,000	1926	30,000
Baker River	Puget Sound Power & Light	Concrete, Wash	36,000†	Fall, 1925	72,000†
Big Creek, No. 1	Southern California Edison	Big Creek, Cal	41,000	July, 1925	73,000
Big Creek, No. 2	Southern California Edison	Big Creek, Cal	32,000	July, 1925	64,000
Yale	Northwestern Electric	Lewis River, Wash	30,000	1926	45,000
Cushman	City of Tacoma	Cushman Lake, Wash	30,000	1926	180,000
Mystic Lake	Montana Power Co	Columbus, Mont	10,000	1925	10,000
Moccasin Creek	City of San Francisco	California	60,000	1925	90,000
Total development			1,215,905	*Extension	

*Extensions to existing plants. †Kva. Capacities given in kva. are figured at 85 per cent power factor in calculating the total.

Steam Stations Under Construction or Going into Operation 1925-1926

Station	Company	Location	Initial Capacity, Kw.	Date of Operation	Ultimate Capacity, Kw.
Northeastern States					
East River	New York Edison Co	14th St. & East River, N. Y. C.	120,000	Summer, 1926	700,000
Richmond	Philadelphia Electric Co	Philadelphia	100,000	Spring, 1926	600,000
Harbor Point	Utica Gas & Electric	Utica, N. Y.	60,000	Jan. 1, 1926	150,000
Holtwood	Pennsylvania Water & Power	Holtwood, Pa	20,000	July, 1925	100,000
Weymouth	Edison Electric Illuminating Company of Boston	Boston, Mass	62,480	Jan., 1925	400,000
South Street	Narragansett Electric Lighting	Providence, R. I	43,500*†	Nov., 1925	.....
Kearny	Public Service of N. J	Kearny, N. J	205,100†	1925	410,200†
Middletown	Metropolitan Edison	Middletown, Pa	30,000	1925	30,000
Lynn	Lynn Gas & Electric	Lynn, Mass	20,000*	1925	.....
Luzerne County	Luzerne County Gas & Elec	Luzerne County, Pa	20,000	1925	100,000
Gould St	Consolidated Gas, El. Lit. & Pwr	Baltimore	56,300	1925	56,300
Southeastern States					
Cape Fear	Carolina Power & Light	Moncure, N. C	15,000*	1925	.....
Hale's Bar	Tennessee Electric Power	Hale's Bar, Tenn	22,500*	1925	.....
Miami	Miami El. Lt. & Power	Miami, Fla	33,300†	1925	84,400†
Fourth Street	Memphis Power & Light	Memphis, Tenn	25,000*†	1925	.....
Market Street	New Orleans Public Service	New Orleans, La	25,000*†	1925	.....
Middle Western States					
Avon	Cleveland Electric Illuminating	Cleveland	67,500	Fall, 1926	300,000
Miami Fort	Columbia Gas & Electric	Cincinnati	80,000	Oct. 1, 1925	240,000
Davenport	United Light & Power	Davenport, Iowa	25,000	June 1, 1925	150,000
Waterside	Louisville Gas & Electric	Louisville, Ky	27,000*	Fall, 1925	.....
Philo	American Gas & Electric	Zanesville, Ohio	80,000	Jan., 1925	240,000
Twin Branch	American Gas & Electric	Mishawaka, Ind	80,000	May, 1925	240,000
Joliet	Public Service Co. of Northern Illinois	Joliet, Ill	30,000*	Jan., 1925	.....
Balls Ford	Iowa Power & Light	Des Moines, Iowa	60,000†	1925	165,000†
Tecumseh	Kansas Power & Light	Topeka, Kan	15,000†	1925	75,000†
Crawford Avenue	Commonwealth Edison	Chicago	160,000	May, 1925	750,000
Neosha	Kansas Gas & Electric	Parsons, Kan	15,000	1925	60,000
Toronto	Ohio River Edison	Toronto, Ohio	66,000	1925	264,000
Detroit	Detroit Municipal	Detroit	80,000†	1925	80,000†
Riverside	Northern States Power	Minneapolis	30,000*†	1925	.....
Big Sioux	Sioux City Gas & Electric	Sioux City, Iowa	25,000†	1925	75,000†
Southwestern States					
Dallas	Dallas Power & Light	Dallas, Tex	20,000*	1926	.....
Shreveport	Southwestern Gas & Electric	Shreveport, La	10,000	1925	50,000
Sterlington	Louisiana Power & Light	Sterlington, La	80,000	1926	80,000
El Paso	El Paso Electric Railway	El Paso, Tex	15,000*	1925	.....
Guadalupe River	San Antonio Public Service	San Antonio, Tex	22,500	Nov., 1926	75,000
Pacific Coast					
Seal Beach	Los Angeles Gas & Electric	Seal Beach, Cal	35,000	1925	200,000
Long Beach	Southern California Edison	Long Beach, Cal	35,000	Jan., 1925	.....
Total developments			1,804,895		

*Extensions to existing plants. †Kva. Capacities given in kva. are figured at 85 per cent power factor in calculating the total.

Transmission Problems of the Future

Will Higher Voltages, Lower Frequencies or Continuous Current Be Used for Transmitting Large Blocks of Power Over Long Distances?—High-Voltage Wattmeter Perfected—Additional Research Planned at New Two-Million-Volt Laboratory

An Interview with

Dr. Harris J. Ryan

"ONE does not have to look far into the future, perhaps ten years or fifteen at the most, to the day when utility companies will be called upon to serve concentrated loads of a million horsepower in the metropolitan areas of the West," said Dr. Harris J. Ryan, professor of electrical engineering at Stanford University, to a representative of the ELECTRICAL WORLD recently. "Economic necessity will require the development of the major water powers of the Pacific Coast. The interconnection of all large operating companies to bring about the most beneficial utilization of this power will follow as a natural consequence.

HARRIS J. RYAN

"We must solve the transmission problems of that day now. We have seen 220-kv. transmission become a realization on two great power systems of California, but future requirements demand that we go still further. The question which confronts us is what options to exercise in the next lap of progress in high-voltage transmission. Shall we increase the voltage, lower the frequency or change to continuous current? If the latter course be adopted, shall continuous current be produced by the transverter or by the vacuum tube? Shall the 220-kv. laterals be constructed with hollow conductors of large diameter or shall small wires be used? These and many other problems will form the basis of our future experimentation and research at Stanford.

HIGH-VOLTAGE WATTMETER PERFECTED

"It is through the use of the high-voltage wattmeter, now perfected almost to our entire satisfaction, that we expect to be able further to develop the laws of corona. Much credit is due my coworker, Joseph S. Carroll, for recent developments in this instrument and for the high degree of accuracy which has been attained. We are now able to measure power as small as one watt on a 150,000-volt circuit. The difficulties incident to the use of a water-column resistor have been overcome. Errors due to capacitance of the water column have been balanced out. The pitch of the cylindrical spiral rubber-tube container of the water-column resistor is varied so as to produce equality of potentials in corresponding sections of the column and of the adjacent shielded space. Complete control over the conductivity of the water-column resistor has been obtained by controlling the supply of water drawn by a small pump from two tanks, one containing fresh water and the other salt water. An ohmmeter has been added to the equipment by which the resistance of the water column may be read directly at any time during a test. The use of a sphere gap for measuring crest voltage values has been eliminated by an ingenious application of vacuum tubes. This device automatically points to crest values through a wide range on a voltmeter alongside of one indicating root-mean-square values.

"During the past winter we have been able further to check our wet-weather corona tests of last year, and we are now making a series of cathode-ray cyclograph tests at frequencies of 10½, 30, 60, 120 and 120,000 cycles. At each of these frequencies the corona loss per cycle, critical voltage, and the E/Q relation of the electric field will be obtained as a further study of the nature or foundation of corona formation.

"The great factor in these studies has been the time duration between voltage crests. Many voltage-charge cyclograms have been obtained from conductors in corona formation over the wide range in frequency just mentioned. In some cases tubular barriers of metal or of glass differing in diameters were mounted concentrically about the conductors in corona. In other cases the corona was formed about parallel conductors suspended on steel towers in the open. The E/Q cycles

thus obtained are interesting because they throw light on the character of the cyclic radial migration of the ions liberated in corona about a conductor. Much as one might expect, these radial migrations increase with the duration between the voltage crests, producing a corresponding increase in the corona loss per cycle. The migrations and consequent losses increase also when an inclosing cylinder is used as an opposing electrode in lieu of a corresponding parallel conductor in the open.

"The tests conducted thus far have been made on 1⅛-in. tubular copper conductors 250 ft. in length strung on steel towers adjacent to the present laboratory. Rain tests made during the past season showed that the losses increased about four times during rain over those during dry weather in the region of the voltage that causes a dry-weather loss of 0.5 kw. to 4 kw. per conductor-mile. Losses were found to vary widely with the nature of the conductor. In some cases conductors which had the lowest losses in dry weather were found to have the highest losses in rain, and vice versa. The determining factor seems to be the extent to which raindrops form on the conductor and change the nature of the brush pattern.

New Developments

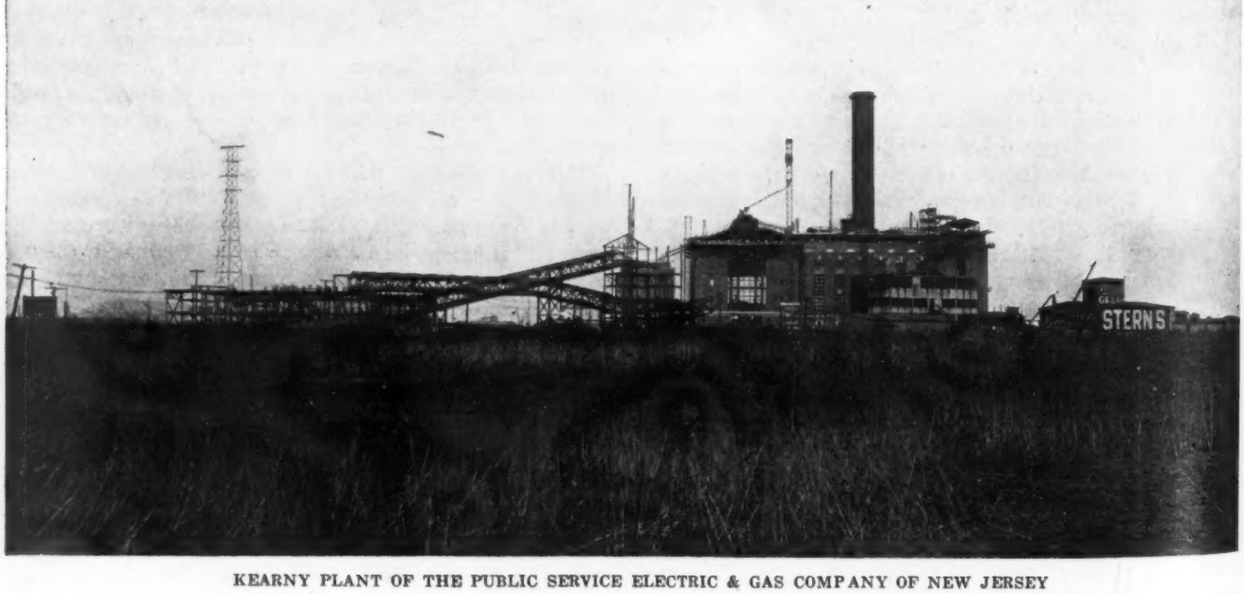
"The 150,000-volt wattmeter will be developed along similar lines for use on voltages up to a million volts, three-phase, for tests on the one-mile million-volt three-phase line at the new high-voltage laboratory. In our corona investigations so far the evidence is strong that the physical and chemical character of the conductor surfaces are of the most vital importance and must be thoroughly investigated. It has been found, for instance, that the oxide film which forms on an aluminum conductor very materially affects the brush pattern so as to raise the critical value of the voltage. This leads to the question of what effect an enameled conductor would have.

"At the new laboratory it is our intention to string short lengths of conductor of many different types and shapes and make continuous observations—not that all of these conductors would be practicable, but to define the limits of the problem and show that they are impracticable and why. For the main experimental transmission line the conductors will be 2 in. in diameter and tubular, so that an insulated wire may be pulled through the center to segregate insulator losses.

"For the transmission line a 300-ft. right-of-way 8,000 ft. long has been obtained. A line of steel masts 125 ft. high will be erected on each side of the right-of-way in lieu of towers. To these masts cross-cables will be strung from which the transmission conductors may be suspended in vertical or horizontal configuration. A telephone line is to be built paralleling the transmission line for communication and for making communication studies. Later it is planned to complete the transmission line right-of-way to a total length of 7 miles, skirting the 9,000-acre university farm on the rear along the foothills.

"Dufour in France has shown that photographic plates in a vacuum are amazingly sensitive for recording cyclograms and transients of short duration. We have gone to work in earnest upon the electron jet recorder, using photographic films in high vacuum, and we have every reason for anticipating that we shall be able successfully to record transients and like phenomena having a duration of but one-billionth of a second. We expect to make this outfit next in importance to the sensitive, accurate high-voltage wattmeter. Other research to be undertaken will include studies of extremely high-voltage cables such as might be used for transmitting power at 220,000 volts across San Francisco Bay on one of the proposed bridges. This will involve experiments with conductors in pipes surrounded by oil or another dielectric."

Dr. Ryan is looking forward with keen anticipation to the continuation of his work of the past twenty-five years with the added facilities he will have at his disposal in the new high-voltage laboratory at Stanford, work on which is to start soon. The researches undertaken will have a great effect on the future of transmission.



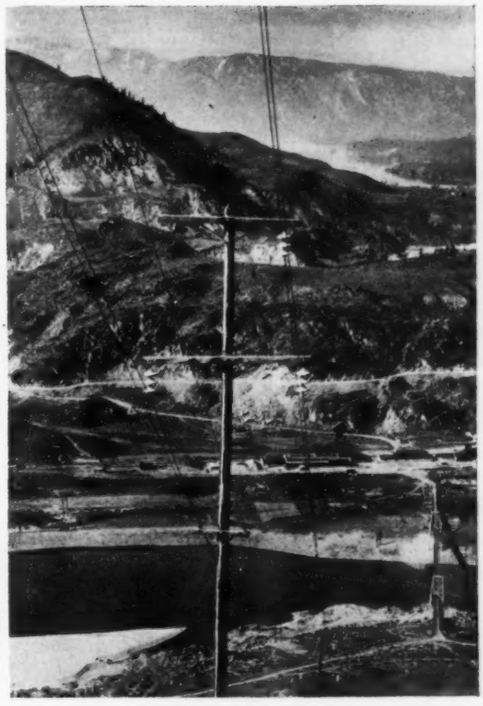
KEARNY PLANT OF THE PUBLIC SERVICE ELECTRIC & GAS COMPANY OF NEW JERSEY

Transmission Practices and Developments

Many High-Voltage Lines in Progress—Conductors and Cable Developments—Stronger Insulators Desirable—Heavy Conductors Require Strong Structures

By A. E. Silver

Electrical Engineer Electric Bond & Share Company, New York



A 60-kv. line of the Washington Water Power Company in the Columbia River territory

HIGH-TENSION transmission lines constructed or planned in recent months, as readily available sources of information, including the columns of the technical press, show, draw attention to the substantial number of really high-voltage installations that have become a reality or are in progress. Lines of 132 kv. and above are the most conspicuous and are of sufficient capacity and importance to demand thorough engineering study in their design.

Lines of lesser voltages and capacities, on the order of those employed for major distribution, from 33 kv. to 66 kv. and even including 110 kv., have claimed a share of attention directed toward increased simplification and economy in construction. One such effort, prompted by the present-day levels of cost, has been toward increasing the life of poles and other materials and in some cases taking advantage of reduction in the quantity of material thereby justified.

In the better-grade lines, using fairly heavy conductors with suspension insulators, "H-frame" construction, so called, has continued to gain favor. This is largely, no doubt, because of the excellent performance realized with this type during several years past in the 110-kv. to 132-kv. class. Horizontal configuration insures against interruptions from "sleet jump." Compared with single poles, the doubled length of span, with halved insulating points and even greater mechanical strength in the supports, gives excellent electrical and mechanical security. On jobs where substantial lengths of this line have been built the construction costs have been reported as very favorable.

However, chief attention has been claimed by heavy lines with steel structures for 110 kv., 132 kv. and 220 kv., and these notes in the main will be confined to this class of construction. In many ways these lines have taken the problems of design into levels of greater magnitude requiring new and more comprehensive methods of treatment. This, of course, is consistent with the constantly increasing degree of service that is being demanded.

These high power capacities make the problem of conductor selection and support a highly important one. Copper and steel-reinforced aluminum continue to be the materials. For the larger-diameter conductors, however, some attention has been given to utilizing other types of cable, such as steel-reinforced copper and copper-clad. These two types, being inherently of high strength, invite efforts in the design of towers to utilize this strength by longer spans and rugged but simplified supports. For essentially straight-away lines over long distances in open country there seems to be sufficient promise to justify further effort in this direction.

An interesting development is a hollow copper cable recently placed on the market that gives promise of being dependable and practicable. Because of the large diameter required to meet the corona limitation, it is frequent that a considerable portion of the copper cross-section can be omitted and still maintain the required conductivity. Mechanically, the remaining metal may frequently provide ample strength for high-grade and economical line design. This would be most likely to occur in situations unfavorable to long-span construction, as where angles are relatively frequent and there are limitations in right-of-way width.

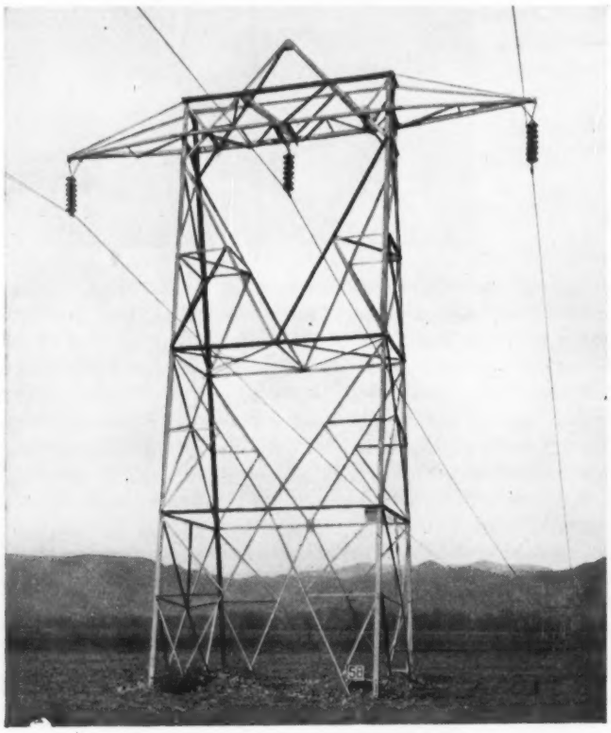
With these large conductors the commonly used McIntyre, or twisted-sleeve, splice is unsuitable. It is too difficult to make up without injury to the strands, and at best its mechanical efficiency is not all that is to be desired. A more suitable splice has been developed by an adaptation of cast-on or wedged-on sockets, either double-ended or single-ended, joined by some type of coupling sleeve. The results seem to assure an entirely practicable, dependable and efficient splice.

An even later and more compact type of splice has been worked out in connection with steel-reinforced aluminum cable. Here the steel core is first joined by compressing a soft-iron tube over the two ends and then similarly compressing an aluminum tube over the outer strands of the conductor. This splice gives especially high efficiency, and both sleeves can be applied with a single press without the need for twisting wrenches or melting furnace.

Perhaps the most significant development pertaining

to transmission conductors is a realization of the occurrence in occasional situations of mechanical vibrations which are of sufficient magnitude to cause injury and even breakage. While a slight and harmless degree of vibration in conductors is probably rather general, the cases where the magnitude has been sufficient to cause injury, have, it would seem, been isolated and infrequent. Apparently these have happened where conditions exist for establishing some form of mechanical resonance. Though the information thus far gathered is meager, it seems to point to light to medium winds as the agitating force. Tautness in the conductor may be one of the conditions most likely to increase the periodicity and amplitude of the waves to the degree where injury to the conductor results.

The vibration does not appear to be due to the conductor material as it has been experienced in various types, including high-strength steel. Indications are that the conductor clamp and method of suspension have a very definite effect on the degree of injury. A clamp with minimum or distributed mass, easy curves and flexible attachment would appear to receive, pass through or reflect any vibration waves with the least liability to concentrated bending that might result eventually in breaking of conductor strands.



TYPICAL 90-KV. TOWER OF THE NEW VALMONT-BOULDER CANYON LINE IN COLORADO

This mechanical vibration is a factor that demands thorough consideration in a heavy high-grade line to make the design such that the conductor will safely ride through any such occurrence that may be encountered. Fundamentally, as a means of predetermining how to avoid the critical combinations, there is real need for comprehensive investigations to determine the conditions in and relations between the conductors, insulators and supporting structures.

As regards line insulation, the need for greater mechanical strength than that of the so-called "Standard 10" suspension unit has brought modifications in this unit which have resulted in what is known as the "high-strength" unit. This modified unit has been sufficiently demonstrated to insure reasonably well its practicability at working loads of around 6,000 lb., which is approximately double the conservative rating of the standard 10-in. unit. The need for a still stronger insulator continues to grow with the progressive steps to conductors of higher strength. However, up to date the manufacturers have not brought out anything of this order that is adequate.

While the problem of insulating lines up to normal voltages of, say, 150 kv., seems to have been met fairly well with suspension strings of the order of ten units, 220-kva. transmission demands insulation of a still higher order of dependability as well as presenting some new factors. Fourteen-unit strings are assuredly successful at 220 kv., nevertheless there are indications at this voltage of undesirable limitations electrically in the application of present insulator types. Among transmission-line designers opinions differ and conclusive information is lacking as to what combinations of insulators, shielding or grading devices, tower clearances and so forth will give the best results. Field experience with insulation for 220 kv. is as yet too brief to settle these questions.

When this is considered in conjunction with the very exacting service demanded from this type of line, it forces the conviction that more thorough and comprehensive research into the problem of line insulation is needed. This should include systematic observation of the electrical conditions occurring in circuits in regular service, the development of more extensive knowledge of the interrelation between conductor-type, overhead ground cables, insulator type, assembly hardware and tower clearances, and eventually the perfecting of designs mechanically rugged and enduring and capable of withstanding any lightning or other surges without flashover.

HEAVY STRUCTURES REQUIRED

In the design of supporting structures there has been no extensive deviation from the rather conventional types of fabricated self-supporting steel towers except for a tendency to the heavier designs and more conservative clearances consistent with the increasing capacity and importance of these lines. Generally, for a given line, to effect economy, the tower designs are worked out in a series of three or more strengths and applied to meet the mechanical duties imposed by the conditions encountered at individual locations, principally span length and angularity.

In any high-grade line it is a sound principle of design that failure of a conductor should not in turn cause failure of the tower in any part. With high-strength conductors, such as used for 220 kv., this requirement may mean an excessively heavy "tangent" type of tower to supply the longitudinal strength necessary to take this assumed unbalanced conductor pull. In some of the more recent line designs this condition is being met by taking advantage of the remote likelihood of a conductor failure assured by the large conductor strength and using a conductor clamp having a gripping power adjusted within predetermined limits, so

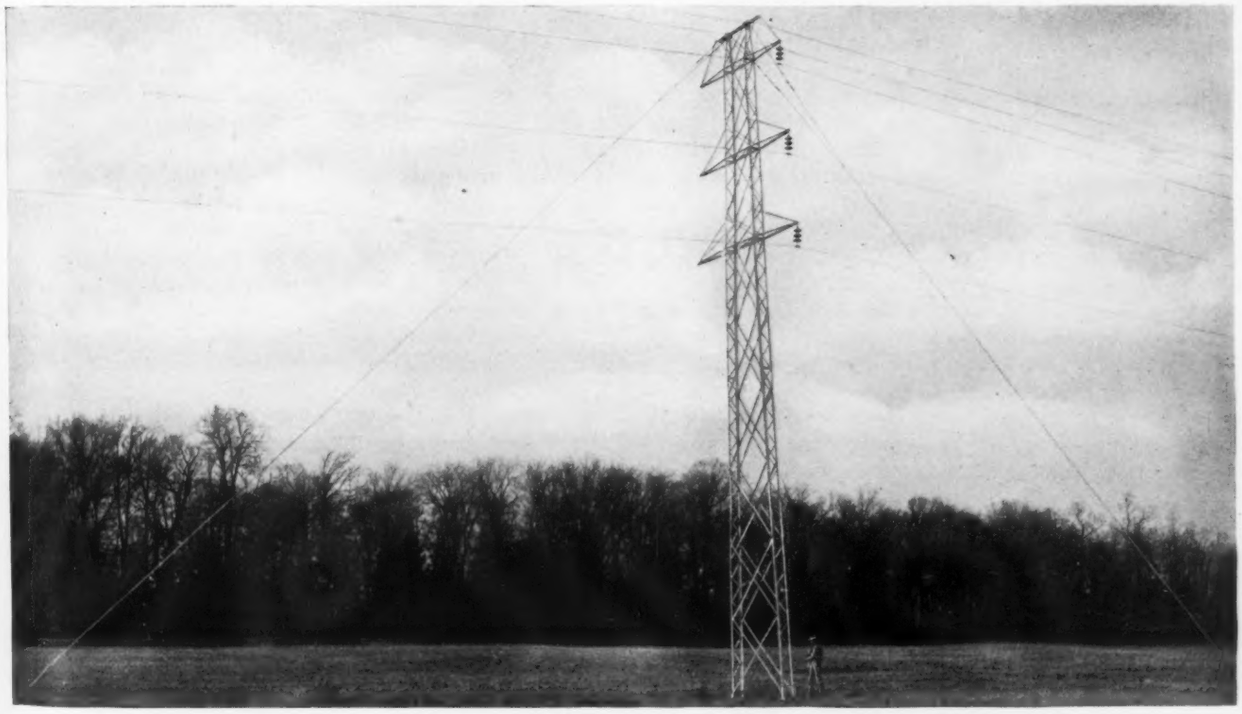
that in the eventuality of a break slippage will occur, rather than transmitting into the tower of more than moderate torsional and longitudinal loads. In this way the weight of the "tangent" type of tower can be kept down to a value consistent with the strength required by the transverse loads.

Again, with such high-strength conductors, to make the line safe against the very large overturning loads at angles and terminals, the conventional type of self-supporting tower with its foundations becomes excessively heavy. To simplify design and economize in the handling of these severe stresses some recent designs have reverted to the principle of the guyed pole used so successfully and extensively in the past for turning angles on lighter lines of pole construction. This is accomplished by setting up a column with yielding or pivoted base to carry vertical load only and taking the conductor pull as a strictly tension load down through an oblique guy to an adequate anchorage in the ground. In open country, where the necessary guying privileges can be obtained at moderate cost, this type of construction promises to effect a considerable economy over the self-supporting tower and to have greater safety, both mechanically and electrically.

In the design of long spans requiring high towers, such as those over navigable channels, the more recent method is to eliminate overturning components of the conductor pull from the tall towers by carrying the conductors through on suspension insulators hanging vertically and dropping down to short anchorage towers, where the conductors are dead-ended against longitudinal movement.

In the "spotting" of towers on the transmission-line profile, for areas with heavy sleet and where long normal spans and long suspension insulator strings, such as those for 220 kv., are employed, an especially careful check of ground clearance must be maintained. Otherwise the longitudinal travel of the conductor under unbalanced ice loads may be sufficient in places to reduce the ground clearance below the point of safety.

For heavy lines tower foundations of structural stubs embedded in concrete are perhaps still looked upon by the majority of engineers as the most conservative practice. However, because of the large increase in the cost of this type of footing, following closely the ratio of increase in labor costs, there has been a very substantial shifting to grillage-type footings; i.e., footings fabricated from structural shapes and designed with sufficient area and rigidity to develop the requisite holding power when buried directly in the earth. The increasing favor for these grillage footings is also in part due to increasing confidence in the life of galvanized steels of this class when buried in soils of the character that generally prevail. This has come from the lack of appreciable corrosion at and below the ground line after extensive experience ranging over periods up to fifteen years and more. There seems, in fact, to be even less corrosion of parts at and below the ground line than of those in the open air.



FLEXIBLE-TYPE TOWER USED BY THE ST. LAWRENCE TRANSMISSION COMPANY NEAR POTSDAM, N. Y.

A relatively new departure in tower foundations is the so-called "Malone anchor," which was developed about two years ago. It consists of a hole bored in the ground with a cavity "sprung" by explosives at its lower end, into which is grouted a deformed angle or other column. It has several very definite advantages over the type installed by open excavation and backfill, the most prominent being undisturbed earth highly compressed in the area around the concrete ball that takes the load. This gives maximum holding power without appreciable movement, while the backfilled footing may yield a matter of inches before it has sufficiently compressed the earth to develop maximum holding power. The holding power of the "Malone anchor" has been well demonstrated by comprehensive tests on experimental foot-

ings in various self-supporting soils, although experience is lacking as to construction methods for its installation in sand, gravel or other flowing soils. Up to date this footing has been successfully installed on at least two important lines, and savings in cost are reported.

In the matter of overhead ground wires the present tendency seems more and more to omit them, notwithstanding that, theoretically and experimentally, they can be shown to be of some benefit in damping out lightning or other high-frequency surges. On the other hand, the troubles actually experienced from mechanical shortcomings have led many operating men and engineers to the conviction that these clearly outweigh any evident advantages. Among these disadvantages are added mechanical load on the towers, breakage from corrosion or other causes and perhaps the falling of the ground wires on the conductors and "crosses" with conductors during sleet conditions because of unequal sag changes as compared with those on the conductors.

With the increasing number of heavy-duty lines and the higher labor rates much effort and ingenuity have been spent and are being spent to apply power machinery to transmission-line construction. Trucks with winches and tractors are being made to perform most of the tasks in delivery of materials, assembling and erecting towers and the pulling out and sagging of conductors. Easily portable power tools have been adapted for work on foundations, such as hole-boring machines, trenching machines, shovels, drills, concrete mixers and tampers for compressing backfills. Tower assembly and erection offer a rather wide opportunity for variation in construction schemes, ranging from complete assembly on the ground to piece-by-piece erection "straight up in place." On some of the more recent jobs ingenious combinations of the two methods have given excellent results.

LINE AND SWITCH CONTROL

A new feature of line design that has been applied to at least one transmission system is that of carrier-current control for sectionalizing switches. With these switches distributed along the line so as to give only moderate length sections, particularly for lines across country difficult of access, there can be pictured a very great aid to the patrol forces through the ability of the load dispatcher to localize a fault quickly, as well as in various other functions of inspection, maintenance and operation. A somewhat similar development is a disconnecting switch for branch circuits that automatically opens after a predetermined number of interruptions in close succession owing to a fault in the branch controlled by the switch that is caused to function by protective equipment.

A suitable amount of synchronous condenser capacity or other means of power-factor control, even for unidirectional flow of power, has become recognized as an integral part of a long transmission circuit, both to gain maximum capacity per unit of cost and to effect voltage regulation commensurate with good service.

In these days, when such terms as "superpower" and "giantpower" are being so freely used for the purpose of popularizing the idea of zone-wide, state-wide and even country-wide interconnection of power producing and distributing facilities, this phase of transmission-line duty is receiving active study. Because the benefits of interconnection are now so thoroughly demonstrated it is inevitable that a rapidly increasing proportion of new transmission lines must sooner or later function as tie lines between load centers or between systems. This being granted, there are several factors that take on new importance and require more careful planning.

Such an interconnecting line should embody means of readily reversing its direction of power flow. Most interconnections are called upon to equalize load diversity and reverse-apparatus diversity between load centers and power stations. It may require the reversal of direction of power flow two or more times each day. The problem then becomes that of a high-tension network the voltage of which at load centers must be maintained at essentially flat values, the flow or power over any leg to be in whatever direction the time-to-time demand may require. The favored means of accomplishing this is by the liberal use of synchronous condensers at receiving points in conjunction with whatever advantage can be taken of the wattless capacity of such generating equipment as may be available. It will readily be appreciated that this requires synchronous-condenser capacity much in excess of that for a line or group of lines where the flow of power is in a single direction only and advantage can be taken of a substantial voltage slope along the line.

As a means of using, at least in part, with a reversible line, this time-honored principle of sloping voltage along the circuit, with a corresponding reduction of the requisite capacity of synchronous condensers, considerable study has been given by both manufacturers and power system engineers to the use of large-capacity transformers designed for changing taps under load, at the discretion of the station operator, without interrupting service. These permit either raising or lowering transmission voltage, without changing low-tension bus voltage, to send or receive power respectively. Such transformers have been built, and the problem of the development of apparatus can be considered as solved in its major features. However, the economic advantage as between condensers and this tap-changing method, either alone or in combination with condensers of lesser capacity, is largely an open question subject to the working out of individual situations.

It is, therefore, evident that in many ways the planning of a transmission line that may become a tie line or a major leg of a general network requires much more complete and far-sighted study than has been customary in the past with one-way transmission lines not intended for interconnection. It is a safe prediction that within a few years virtually all transmission systems will have spread out so that electrical interconnection with neighboring systems will have become a fact. Therefore, in planning any substantial section of new transmission line or the fundamentals for any new or reconstructed transmission system, those conditions should be taken into account which relate to immediate or later "matching up" with neighboring systems.

Executives and engineers who guide intercompany policies and the planning of essential system facilities will aid in a thoroughly constructive step by taking the initiative in organizing intercompany engineering committees to study these problems jointly.

Status of Rural Electrification

Its Accomplishments and Problems—Activities of Sixteen State Committees—Consensus of Opinion Is that Farm Load Can Be Made Profitable to Utilities and Attractive to Farmer if Machinery Is Adapted to Electric Drive

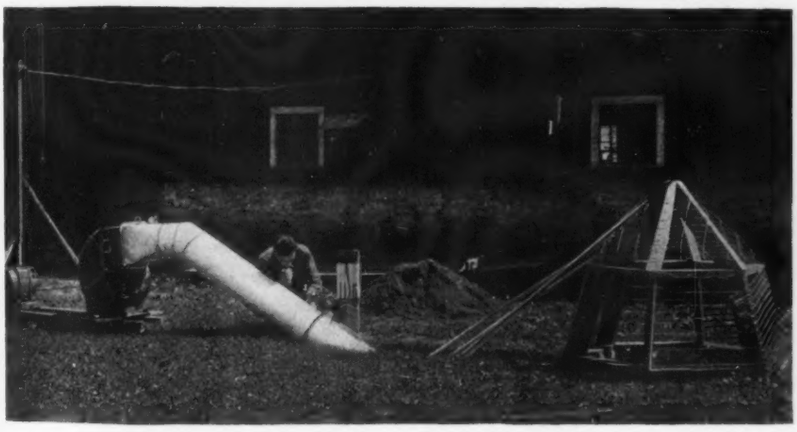
By Allen M. Perry
Western Editor "Electrical World"

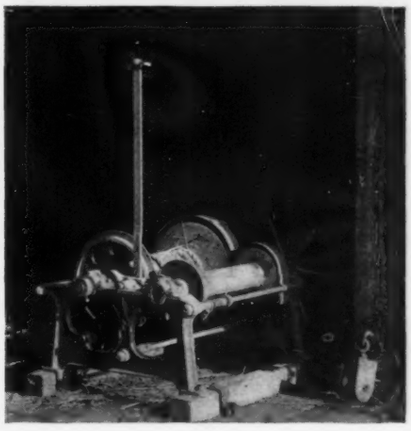
WHEN it is realized that of three hundred and fifty billion dollars of national wealth agriculture represents seventy-eight billions, the national co-operative movement to study the relation of electricity to agriculture should command national recognition and support, if for no other reason than that never before has anything been done which has so tended to make these two industries appreciate that in many respects their interests are identical. This is particularly true of the rate of turnover of capital, which in the case of agriculture is once in seven to eight years and with utilities once in four or five years —taken together, these are the lowest for all industries. Should this movement accomplish nothing more than to create a better mutual understanding, it will be fully justified. But it has accomplished more already. A positive mental attitude is rapidly displacing indifference or negative criticism. Utilities are analyzing cost of rural distribution more thoroughly. Farmers have received new viewpoints about finance and accounting. Co-operative work has been stimulated between agricultural-equipment and motor manufacturers. Field experiments have shown that farmers can and will use electricity at remunerative rates as soon as machinery is adapted to motor drive. Evidence has been produced that farm load can be built.

Moreover, experimentation has produced new ideas on preparing feed, shown that refrigeration may revolutionize farm life and marketing, proved that power-driven cream separators will produce a more uniform grade of cream and that farm comfort and convenience can be improved by electrification. Unusual promise is shown in the drying of hay and grain, in the effect of artificial light on egg production, and in the effect of ultra-violet light on animal growth.

Already the work has developed a need for men to bridge the gap between farms and utilities; for efficient grain elevators to cut down handling charges, especially in small communities, and for simple rate structures that can be justified and comprehended and that will stimulate the use of energy.

Among the farm applications which are being studied with a view toward electrical applications are (1) lighting, (2) heating, (3) cooking, (4) household application, (5) wiring, (6) water supply, (7) small and large power stationary operations, (8) field work and cost of production, (9) hauling, (10) drainage and irrigation pumping, (11) drying, (12) refrigeration, (13) poultry husbandry and egg production, (14) animal production, including feed curing and water heating; (15) sterilization and pasteurization, (16) combating insect pests, (17) food preparation, including meat curing; (18) carrying processes farther on the farm, (19) utilizing present wastes, (20) supplementing industries, and (21) plant growth.





LEFT—EQUIPMENT FOR CURING STACKED GRAIN. RIGHT—MOTOR-DRIVEN HAY-HOISTING WINCH

Virtually every problem met so far has involved three broad phases. First is mental integration of the particular problem—its importance, its relation to agriculture and the possibilities of success. Next comes the mechanical solution, taking full advantage of the characteristics of electricity. Following this comes the adaptation of a mechanical solution to an agricultural

TYPICAL RURAL SECTION BEING SERVED BY ELECTRIC LINES

system, or in many cases reversing the process by adapting the agricultural system to the mechanical solution. Already equipment is available for the farm home. Some minor changes may be desirable, but almost without exception urban home equipment fills the bill in the rural home. Considering farm equipment other than for the home, experience clearly indicates that it requires a man of considerable ingenuity to adapt present electrical equipment to present farm equipment. The patience of the majority of farmers would be exhausted in the contemplation of such a move.

PERTINENT QUESTIONS

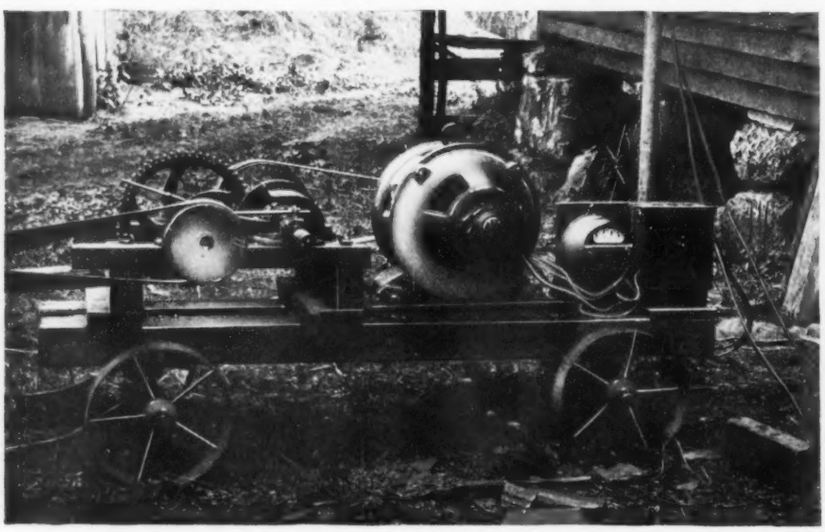
Hence all persons who are interested in rural electrification are faced with the following questions: What is the logical place for the individual drive? Is there a place for a general purpose motor? If so, what sizes are desirable? Can the demand factor of various operations be reduced and still meet the requirements of efficient farm operation? What automatic feature can be introduced? Is there a practical way to get electric power to field operations such as plowing? Is there a place for refrigeration outside the house? Will artificial drying ever become an established operation? If so, what part will electricity play in this? What are the possibilities for the use of the ultra-violet ray?

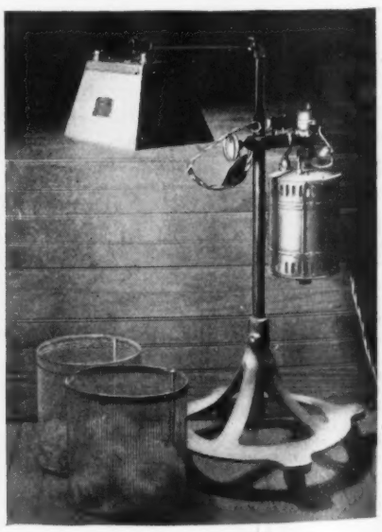
Rural service has characteristics and requirements which place it in a class distinctly different from any other service now rendered. As Dr. E. A. White, director of the National Committee on the Relation of Electricity to Agriculture, says: "It would appear to be wise to recognize this and plan accordingly. Generally speaking, an attempt has been made to maintain a relation between the rates offered farmers and urban residential rates. Why would it not be more logical and satisfactory to build rural rates on the basis of the cost of rendering this service?"

To meet the requirements of farmers and utilities the rate form should be simple. It should be possible to justify every item on the basis of costs involved. In some form or other a relatively high initial step is desirable to protect the investment in cases where the consumption of energy is low. Once this first hump is passed, there should be a rapid drop to encourage the use of energy. One rate structure is desirable; two or more only serve to complicate matters. Considerable study has been given to the rate problem by the Iowa Railway & Light Company, the Northern States Power Company, the Adirondack Power & Light Company and the Wisconsin River Power Company.

Committees on the relation of electricity to agriculture have been organized in sixteen states, namely, Alabama, California, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, New Hampshire, Ohio, Oregon, South Dakota, Virginia, Washington and Wisconsin. New York State has two standing committees which are working on this problem. These states are at various stages of progress, ranging from the organization of investigational work in Ohio and Michigan to investigations over a year old in Minnesota.

Rather than draw conclusions now after they have been in operation for only a short time, the state committees consider it better to proceed slowly and keep on the right track. It is entirely too early to decide anything on line construction unless it is that engineers will probably have to abandon the old idea of rural distribution and plan for a growth in load that could





LEFT—MOTOR OPERATING GRAIN ELEVATOR. RIGHT—ULTRA-VIOLET LIGHT PROMOTES HEALTHY GROWTH OF CHICKS

hardly be imagined years ago. Instead of spending money and time trying to economize in distribution expense, it is much better economy to build in such a way that adaptation can be made for the near future without scrapping equipment.

Following is a summary of experiences in each state. In making it the date at which co-operative work started and the chairman and project director, or secretary, of the state committee are given to facilitate exchange of information:

Alabama

January, 1924; E. A. O'NEAL, *Alabama Farm Bureau, Montgomery, and* PROF. M. L. NICHOLS, *Alabama Polytechnic Institute, Auburn, Ala.*

On January 1, 1925, there had been completed or was under construction 106 miles of rural line, all of which is included in the investigational work of the committee and is serving approximately eighteen customers per mile. In some instances the farms are one mile apart, but virtually all of the lines are also serving small community centers. Only a few sections can, it is reported, be economically served without some community enterprise.

The connected load per farm on the experimental line varies from a lighting load of about ½ kw. to as high as 45 kw. on a dairy farm in Etowah County. Most of the farmers have only small loads, which, however, are building up gradually. The energy consumption is increasing very rapidly, especially with new lines, which show a gain even during the first six months. The average consumption per customer per month for a six-months' period ended November 30, 1924, was 31 kw.-hr., and for the month of November it was 38 kw.-hr. In the case of lines which have been in operation for more than a year the energy consumption per month is as high as 400 kw.-hr. on one individual farm.

Experimental lines were entirely financed by the Alabama Power Company except in two cases where the lines were built before the co-operative project was begun. The farmers buy their own utilization equipment at regular list prices under the same terms offered to other individuals.

California

October, 1924; PROFS. L. J. FLETCHER *and* B. D. MOSES, *California College of Agriculture, Davis, Cal.*

In 1923 there were 30,000 electric motors used on California farms, the total number of rural customers being 26,915 and the total energy consumed on farms 421,646,000 kw.-hr. According to a recent survey made by one of the power companies, there are 2,156,000 acres of land irrigated by electrically driven pumps in California.

Four major committees have been formed to study (1) cost and other data concerning present utilization of electricity, (2) methods of establishing agricultural power rates, (3) utilization of electricity in the farm homes; (4) economic uses of electricity in California agriculture. The latter will include (a) irrigation pumping, (b) finishing and processing farm products, (c) poultry-farm equipment; (d) dairy farm equipment, and (e) horticultural applications.

A survey of spray-machinery manufacturers indicates that there are at least ten thousand portable spray rigs used by California fruit growers driven by gas engines aggregating 22,500 hp., and requiring approximately 10,000,000 hp.-hr. per year, which afford an opportunity for electrical applications.

Illinois

June, 1923; DEAN H. W. MUMFORD, *and* PROF E. W. LEHMANN, *University of Illinois, College of Agriculture, Urbana, Ill.*

Ten farms in the vicinity of Tolono, ranging from ¼ mile to ¾ mile apart and typical of the grain, dairy, seed-production, pure-bred stock, poultry and general farms of the state, will be electrified. The transmission line will be about 7 miles long and give access to twenty-five or thirty possib'e customers. All of the farms are operated either by their owners or by men renting from relatives. Work is interchanged and some community machines are used. The farms range in size from 75 to 600 acres. Each of the farmers will pay $360 for the cost of building the power line, but the remainder of the cost will be paid by the Central Illinois Public Service Company.

On each farm a separate meter will be used for measuring the power for each operation, and all electricity that is strictly for experimental purposes will be furnished free by the utility company. Special attention will be given to the study of household equipment and to grain and hay drying (see ELECTRICAL WORLD, September 27, 1924, page 701). Equipment in the way of ranges, washing machines and other appliances will be furnished by various manufacturing concerns on a loan basis. At the end of the experiment the farmers will have the opportunity to buy this equipment.

Indiana

January, 1925; G. I. CHRISTIE *and* T. E. HIENTON, *Agricultural Experiment Station, Division of Rural Engineering, Purdue University, Lafayette*

Experimental work will be carried on in two sections of the state because of the wide variation in types of farming between northern and southern Indiana.

Problems affecting the electrification of fruit and poultry farms will be studied at the Purdue agricultural experiment station farm, near Bedford, in co-operation with the Interstate Public Service Company. A three-thousand-tree orchard together with a new eight-thousand-dollar apple storage house provides excellent opportunities for studying orchard heating, stationary spraying, artificial refrigeration and precooling of fruit. Incubation and brooding with electricity are also receiving attention at this farm.

Electrification of dairy and general farms in northern Indiana and the problems connected with it will be studied on a rural electric line near Wanatah. This line, it is understood, will be provided by the Calumet Gas & Electric Company to connect the Pinney Purdue agricultural experiment station farm with the town of Wanatah. Six or seven farms will co-operate in this work in addition to the 400-acre Pinney Purdue farm, where a large amount of the work on new uses and equipment will be done.

Iowa

November, 1924; CHARLES E. HEARST, *Iowa Farm Bureau Federation, and* PROF. FRANK D. PAINE, *Iowa State College, Ames, Iowa*

An experimental farm line centering around Garner, Iowa, serves sixty-nine Iowa farms, which constitute a field laboratory. To avoid poor voltage regulation it has been found advisable to install the service transformers in the center of each farmhold. On twelve farms each motor and appliance are equipped with recording demand and watt-hour meters. Instead of using large motors for short periods, efforts are being made toward adapting operations to long-period operation by sma l motors. In addition, research work is being done in the agricultural experiment station looking toward new uses.

Farm incomes are being studied with the view of ascertaining what the farmers can afford to buy and economic considerations involved in the use of electricity in farm production.

According to a survey (made before any attempts to develop loads) of 270 farms in different parts of the state served from transmission lines all used electricity for lighting, 81.5 per cent for flatirons, 67.8 per cent for washing machines, 28.2 per cent for vacuum cleaners, 20.8 per cent for well pumps, 14.1 per cent for pressure pumps, 7.4 per cent each for separators, feed grinders and curling irons and 6.3 per cent for milking machines.

A very interesting contract is being considered which is based on the utility's financing, installing, maintaining and operating the system. By the terms of this contract the farmer pays (1) a monthly charge—composed of (a) meter expenses, bil'ing, etc.; (b) service line charge, (c) transformer charge, (d) pole-line charge, (e) demand charge—and (2) an energy charge of 2.9 cents per kilowatt-hour. The energy rate will be increased or decreased with the beginning of each fiscal year, depending upon variations in energy cost per ton from a base energy cost.

Kansas

February, 1924; F. D. FARRELL, *president of the Kansas State Agricultural College, and* PROF. H. B. WALKER *Manhattan, Kan.*

An exhaustive rural electric survey is being made regarding present uses of electricity and tendencies in the chief

agricultural regions. Kansas has about nine hundred farms receiving service from central stations, and 324 of these have been surveyed for such data as location, duration of central-station service, chief sources of farm revenue, extent to which various electrical applications have been used, relation of electric drives to other drives for water systems, the type of power used for farm belt work.

The most promising field for applying electric motors to farm belt work is found in grain grinding and elevating, wood sawing, ensilage cutting and irrigation pumping. Electric motors are now used extensively for the latter purpose in the Arkansas River Valley. More than 60 per cent of the farms surveyed use ice during the summer or have some type of refrigeration plant; more than 50 per cent use artificial ice, and an appreciable number are interested in electrical refrigeration.

From the survey it appears that the dairy farmer is the best potential customer, with the livestock (beef cattle, hogs and sheep) farmer second and the grain farmer third. Poultry and horticulture both offer promise, but these types of farming are not extensively followed in Kansas. The dairy farmer has a fairly uniform demand for energy throughout the year. While some Kansas farmers are now using more than 500 kw.-hr. per month, they are rare exceptions. A fair number consume approximately 200 kw.-hr. per month, while a majority are using under 30 kw.-hr. per month.

TABLE I—EFFECT OF WINTER ON ENERGY CONSUMPTION OF RED WING INSTALLATION

Farm	Last Reported	December	January
	Kilowatt-Hours per Month		
I	143	186	279
II	520	594	717
III	75	120	94
IV	29	56	34
V	169	383	379
VI	114	594	142
VII	35	115	102
VIII	67	74	321
Average	144	265	258

Prof. J. S. Hughes, Department of Chemistry, Kansas State Agricultural College, has conducted extensive investigations into the effect of ultra-violet light on laying hens and on the bone development of young growing chickens. The results were quite conclusive as regards the value of this treatment.

Michigan

DEAN G. W. BISSELL, *Michigan Agricultural College, Lansing, Mich.*

Co-operative investigation is getting under way in Michigan, where an experimental line about 12 miles long to serve twenty-five customers is being built near Parma by the Consumers Power Company to serve as a fie'd laboratory. Before this committee was formed about three thousand rural customers in the state were served by lines financed chiefly by the consumer, but it is believed that after a co-operative study the business can be developed sufficiently to permit the utilities to finance the lines in the future.

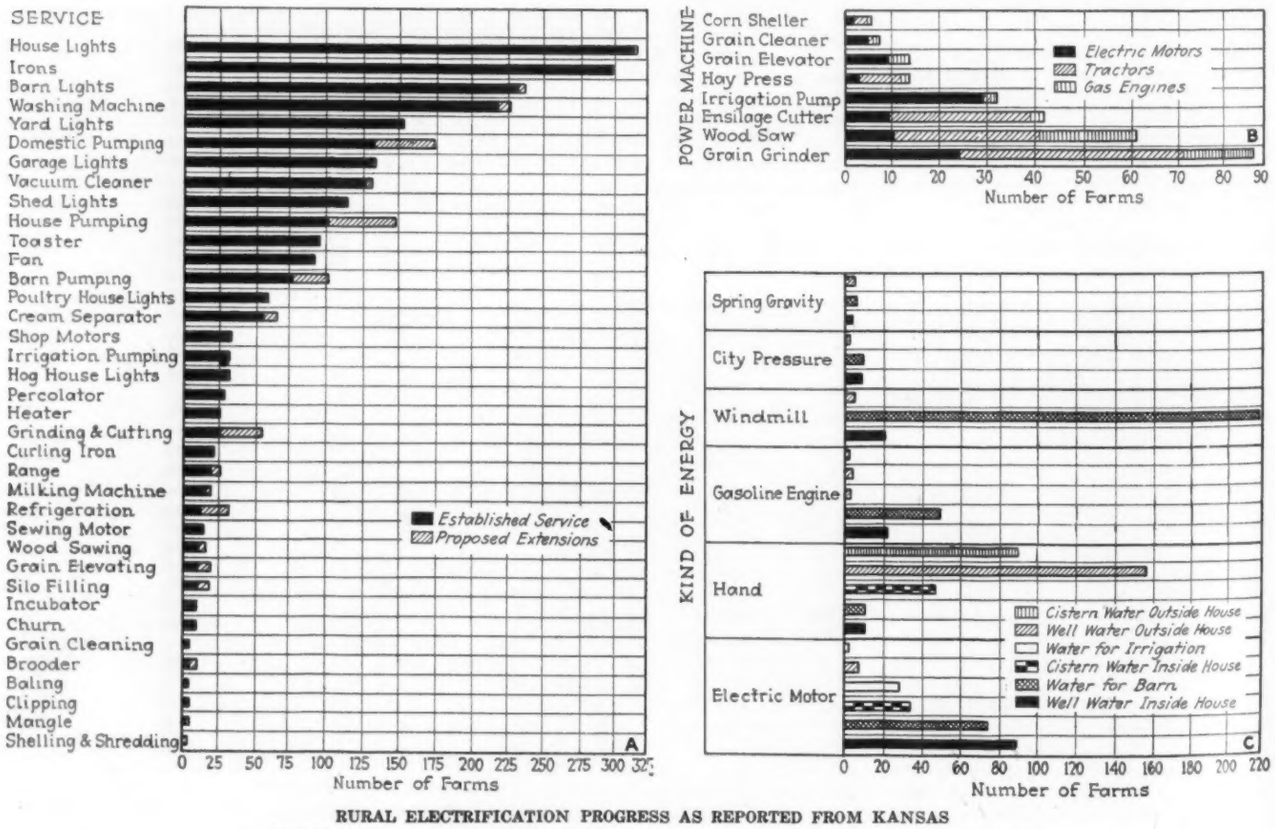
Minnesota

January, 1923; JAMES F. REED, *Minnesota Farm Bureau of Federation, and* PROF. E. A. STEWART, *division of agricultural engineering, University of Minnesota*

The chief aim in Minnesota has been to determine as quickly as possible whether the farmer has available enough uses for electricity to make it economically profitable for him to use electricity at the rates which he must pay. The rates must be sufficient to justify the service given by the utility. Consequently, as many different pieces of equipment as possible have been installed and tried out to uncover rapidly the problems that are holding back the application of electricity to agriculture.

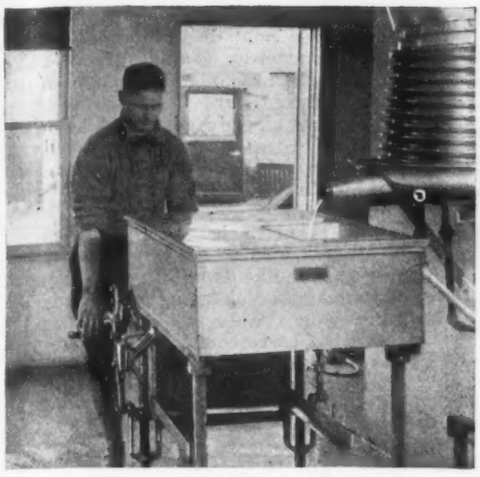
The Red Wing experimental line, which has been serving eight farmers since the early part of 1924, has been the field laboratory for most of the investigation, although the experiment station of the University of Minnesota has also been doing considerable work.

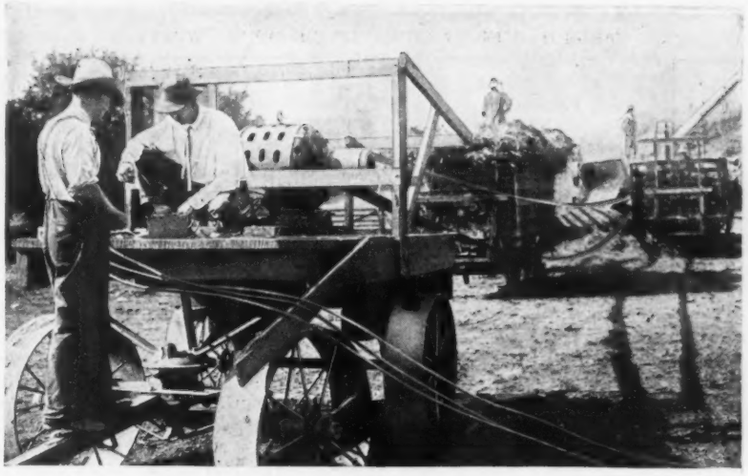
From experience so far the oustanding problem in serving the farmer at a price which is economical to him is chiefly a question of the amount of energy he can use. Since the price will necessarily be high if only a small amount of energy is used, the problem is to develop enough useful energy to make the unit cost low. Where farmers invest in the line they do not have money to invest in equipment, therefore



RURAL ELECTRIFICATION PROGRESS AS REPORTED FROM KANSAS

A. Distribution of electrical equipment on 324 farms. B. Relative use of electricity for farm belt work on 325 farms. C. Types of water systems now in use on 324 farms.





LEFT—MILK COOLER AND BOTTLE-CAPPING MACHINE—MOTOR-DRIVEN SEPARATOR IN SAME ROOM.
RIGHT—PORTABLE MOTOR-DRIVEN THRESHING MACHINE

the Minnesota committee considers it essential that the farmer should not put his money into the building of the line, which should be financed by the utility.

New Hampshire

January, 1925; Director J. C. KENDALL *and* W. T. ACKERMAN, *University of New Hampshire Experiment Station, Durham, N. H.*

Investigations are being carried out concerning the uses of central-station energy on farms and communities of New Hampshire with the following objects in view:

1. To determine what constitutes the maximum amount of electricity that can be economically and efficiently used on representative farms in the state.
2. To investigate the possibilities of using electricity in community enterprises.
3. To make a survey of the present uses of electricity in the state.

Ten experimental farms, comprising two dairy farms, two fruit farms, two poultry farms and four general-purpose farms—each one being representative of New England conditions—are being selected for the experiment. These will be located on already existing rural extensions with the view of studying and developing equipment and processes which will utilize electrical energy.

Electric service is at present installed on approximately 10 per cent of the farms of New England; but there is reason to believe that it has not been used even on these farms to the extent that is practicable because of the lack of machinery adaptable to its use and lack of information on applications of electricity to farm work and home life.

The investigation of the use of electricity in community enterprises will be made in connection with farmers' exchanges, co-operative packing and grading plants, shipping associations, etc. Moreover, with the desirability of the farmer having winter work to supplement farm income, the possibilities of developing co-operative power-using industries for work with wood or other materials, in which he can have this seasonal employment, deserve inquiry.

New York

PROF. HOWARD W. RILEY, *New York State Agricultural College*

The extensive industrial and urban development of the state has resulted in correspondingly large electric power developments. Suburban electric service near the large centers is well developed and numerous farms are supplied from these lines. Service of a strictly rural nature has been offered by several companies for some years, and several thousand farms are thus served. Systematic studies of rural rates and contracts have only recently come up for careful consideration.

The Empire State Gas and Electric Association now has two standing committees studying the rural service problem—one, the rural lines committee, being engaged in studying the technical phases of line construction in rural territory, and the other, the committee on farm service policy, being engaged largely on the questions of rates, contracts and general policies.

A conference committee representing the agricultural interests has drawn up a report giving a synopsis of the general situation as it exists in the state and calling upon the power companies to give to the rural problem prompt and adequate consideration. In response to this action a conference between this committee and representatives of the leading power companies was called by President M. S. Sloan of the Empire State Gas and Electric Association on April 6, 1925, at Albany and the question of the needs of the farmer and the responsibilities of the power companies was discussed, Owen D. Young being the principal speaker.

The College of Agriculture, through its departments of rural engineering and poultry husbandry, has already made, as part of its regular program, careful studies of the proper methods for poultry-house illumination, and other problems of rural application of electricity will be taken up in due course.

The larger power companies are establishing special departments of rural service manned by men trained in engineering and with a knowledge of agriculture and of rural conditions.

Ohio

DEAN ALFRED VIVIAN *and* PROF. P. B. POTTER, *College of Agriculture, Ohio State University*

The committee has been organized and a program is under way. Prior to the co-operative movement the Dayton Power & Light Company had developed considerable rural business.

Oregon

May, 1924; JAMES T. JARDINE, *Agricultural Experiment Station, chairman;* PROF. W. J. GILMORE, *Oregon Agricultural College, Corvallis, secretary*

More than two hundred farms, 188 of which are adjacent to ten typical rural electric lines, representative of the chief agricultural areas of the state, have been surveyed. The results have been digested and conclusions drawn.

Perhaps the most pronounced fact revealed by the survey was that by far the majority of the farms where electricity is available (estimated at 10 per cent of those in the state) used energy mainly for lighting and minor household purposes, which resulted in a small total consumption and, in consequence, relatively high rates.

The extent to which electrical energy used is related at present to its cost is shown by the fact that on one line the average cost per kilowatt-hour was 12 cents, with an average consumption per month of 12 kw.-hr. per user, while on another line the average cost was but 1½ cents per kilowatt-hour, with an average consumption of 600 kw.-hr. per user per month. The same variation was frequently found on a single line.

The average farm on the lines surveyed paid $4.90 per month for electricity, including power for irrigation pumping. Omitting irrigation, the average monthly cost was $3.27 per customer.

Next in importance to irrigation pumping from the standpoint of power

TABLE II—ENERGY CONSUMPTION ON SIX WISCONSIN FARMS

Farm	Remarks	Average and Monthly Maximum Consumption			Total
		Light	Heat	Power	
I	Milking and separator	26 (31)		50 (71)	59 (90)
II	Range, pumping and washing	33 (46)	294 (409)	23 (37)	286 (464)
III	Washing	25 (37)		4 (7)	28 (40)
IV		84 (89)		49 (90)	122 (169)
V	Heating dairy water, warming, milking, separator	32 (46)	65 (82)	71 (113)	147 (240)
VI	Milking	24 (43)		13 (19)	30 (44)

use were motor-equipped water supply systems. Out of 120 farms using electricity and not supplied with gravity water sytems, forty-eight motors were in use for this purpose.

Another popular use of electric power was in the operation of milking machines. Supplemental information obtained from the Coast Power Company in Tillamook County, the chief dairy county of the state, revealed that fifty-nine farms out of 213 served by that company were using milking machines, all but one of which were operated by motors. These fifty-nine farms represented nearly half of the total number of cows on all the farms, averaging 31.2 cows each, or a total of 1,842 cows out of 4,012 on the circuit.

The average cost of construction per mile of the 34 miles of line surveyed was $1,024. Each mile serves an average of 4.17 customers, making the average investment per customer $245.95.

South Dakota

December, 1923; J. W. BATCHELLER, *Mission Hill, and* PROF. RALPH L. PATTY, *State College of Agriculture, Brooking, S. D.*

As in Alabama, very little equipment is being loaned or provided to farmers at less than market cost, and still the average energy consumption per farm attained in South Dakota last December was 117 kw.-hr. per month. The chief purpose is to determine how the farm load will develop under intelligent supervision.

An experimental line has been built in the vicinity of Renner to serve seventeen farms (four rented, thirteen operated by owners), averaging 257 acres each, of which 180 acres is cultivated.

On January 1, 1925, the electrical equipment on the line had increased to forty-eight motors, sixteen flatirons, six curling irons, six small heaters, five toasters, two electric ranges, three electric refrigerators and two fans.

The Northern States Power Company has built the lines and furnished the transformer. The farmers build the stub lines, furnishing their own wiring and equipment. A fixed monthly charge is assessed which varies slightly with the peak load for the month, averaging very close to $8 per month. In addition, each farmer pays an energy charge of 5 cents for the first 30 kw.-hr. and 3 cents for each kilowatt-hour thereafter.

Virginia

September, 1924; PROFS. C. E. SEITZ *and* J. A. WALLER, JR., *Virginia Polytechnic Institute, department of agriculture and engineering, Blacksburg, Va.*

An experimental farm community line is being built to permit a detailed study of farm applications, and a man who will devote his full time to investigational work started a survey last September which will be followed by demonstrations of results obtainable.

Washington

January 19, 1925; PRESIDENT E. O. HOLLAND, DEAN E. C. JOHNSON *and* PROF. L. I. SMITH *of the State College of Washington*

The organization meeting of the state-wide Committee on the Relation of Electricity to Agriculture for Washington was held on January 19, 1925, at which meeting it was agreed that a study of the uses of electricity in Washington agriculture should be made. There are already more than twenty thousand rural users of electricity in the State of Washington and in the neighborhood of 1,500 miles of rural lines.

Two rural lines in each district will be studied, one which might be considered a poor line from the standpoint of the amount of electricity used and another where a larger amount is consumed. A state committee meeting will be called early in the fall, at which time the results of these studies will be presented and plans made for further investigational and experimental work. It is understood at the present time that some investigations will be carried on at the State College of Washington at Pullman and that certain farms will be selected in the different districts and will be electrified as far as possible in order to study all the possible uses under the varying conditions of each district.

Wisconsin

April, 1924; DEAN H. L. RUSSELL *and* PROF. F. W. DUFFEE, *University of Wisconsin, department of agricultural engineering, Madison, Wis.*

Six farms engaged in general farming operations and two pea-viners are connected with the experimental line at Ripon. Dairying predominates, although hog raising receives considerable attention. None of these farms formerly had electric service from utility lines, although two had isolated plants. The farms cover 75 to 240 acres, but are not show places. Among the farm applications which have been tried up to the present time are milking, heating water for washing milking utensils, feed grinding, electric incubation, hoisting hay, artificial curing of bundled grain in the sack, together with various operations that can be accomplished by the use of a general utility motor. Artificial hay and grain drying, particularly, were studied last summer.

The monthly energy consumption ranges from 350 kw.-hr. to 400 kw.-hr. where a range is connected down to 30 kw.-hr. or 40 kw.-hr. on other farms. Most of the applications have been working out quite successfully. Two which have not proved strictly successful so far are dishwashing and curing of green soy beans in the sack by artificial ventilation. (See ELECTRICAL WORLD for August 16, 1924, page 323.)

The rate structure in effect on the Ripon line is one which was worked out some time ago by the rural lines committee of the Wisconsin Utilities Association, but it is now thought that it can be changed to advantage. The line was financed by the farmers, who purchased such equipment as they expected to use regularly, other equipment being loaned to them. The principal changes which are contemplated in the rate structure are the establishment of a fixed charge and a low energy charge, making the combined charges decrease rapidly with energy consumption.

TABLE III—CHARACTERISTICS OF EXPERIMENTAL RURAL LOADS IN SOUTH DAKOTA

Month	Fixed Charge Total	Total Consumption (Kw.-Hr.)	Average per Customer (Kw.-Hr.)	Bill 17 Farms	Average Bill per Customer	Peak Load (Kw.)
1924						
January	$7.90	748	41.12	158.22	9.89	6
February	8.27	800	50	165.37	10.335	8.3
March	7.85	779	45.8	166.04	9.767	6.1
April	7.97	820	48.24	168.99	9.94	6
May	8.06	810	47.7	169.82	9.99	6.5
June	8.35	752	44.2	172.34	10.34	8.0
July	8.04	754	44.35	166.82	9.813	8.8
August	7.98	1,162	68.352	170.13	10.007	8.5
September	7.98	1,355	79.7	185.89	10.93	8.5
October	7.98	1,457	85.7	189.09	11.12	8.5
November*	7.93	1,911	112.4	199.34	11.73	8.5
December	7.93	1 997	117.47	201.54	12.24	8.5

* After tour.

Power and Business in the West

Power Sales Increase at Double the Rate of Increase in Total Volume of Business—Survey of Business and Power Conditions —Companies Have Faith in the Future

By Allan Sproul
Assistant Federal Reserve Agent
Federal Reserve Bank, San Francisco, Cal.

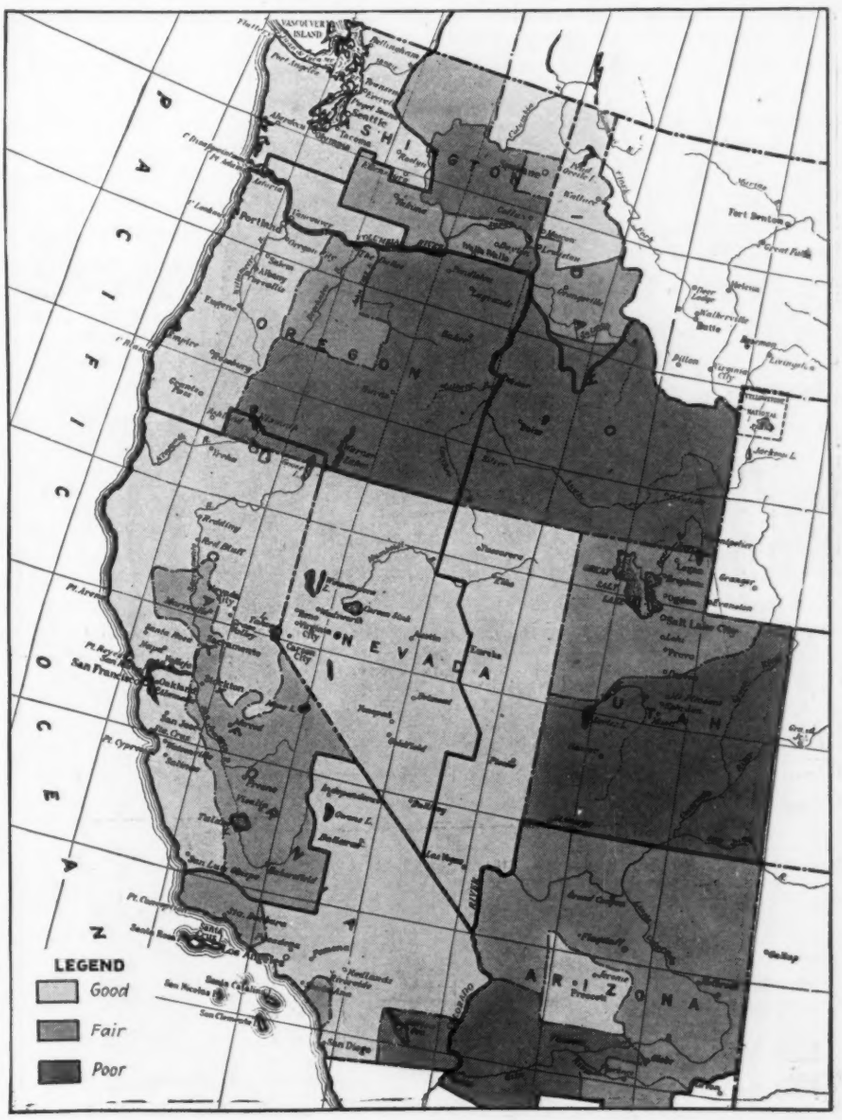
THE electrical industry of the far western part of the United States is not a stranger to power men, wherever they may be. Its achievements, both in the field of power production, transmission and application and in the field of public utility economics, have been many and well advertised. If in California higher voltages are transmitted over greater distances than is done elsewhere, you hear about it. If in the pursuance of their public relations work, the Western utilities evolve methods for making customer ownership a working reality, the world is soon advised of the success of the plan. What is not so well known, perhaps, is the essential part the electric power industry plays in any well-conceived vision of an agricultural and industrial empire in the West.

Power the West must have, as must any region which aspires to great achievement in the modern world. And fortunately the West is rich in hydro-electric power resources. The Federal Power Commission estimates that of the 9,086,958 hp. installed capacity of hydro-electric plants in the United States on January 1, 1925, 2,577,608 hp., or 28.4 per cent, was in the states of Arizona, California, Idaho, Nevada, Oregon, Utah and Washington. Undeveloped hydro-electric capacity in these states on that date totaled 17,261,392 hp., or 67.1 per cent of the estimated total undeveloped hydro-electric horsepower in the United States.

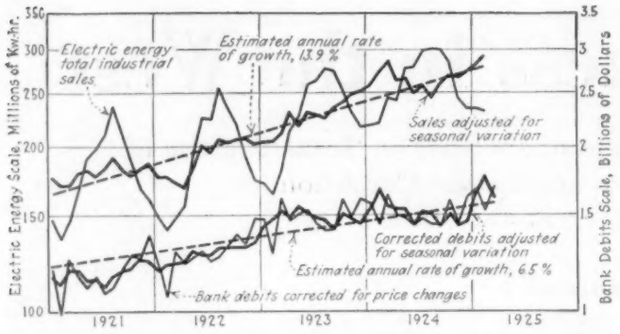
Power resources are being developed under a wise private ownership which, recognizing the public character of its service, has taken steps to stimulate enlightened public interest and to invite an informed public participation in its business. One example of this latter phase of the industry will suffice to illustrate the point. At the close of 1924 there were 129,000 stockholders listed on the books of the twelve principal electric power companies in California, and of this number nearly 110,000 resided within the borders of the state.

In other words, approximately one out of every forty people (men, women, and children) in the state is a stockholder in an electric power company.

The West is a country of recent settlement and it is



FINANCIAL CONDITIONS IN THE TWELFTH FEDERAL RESERVE DISTRICT AS OF APRIL 28, 1921

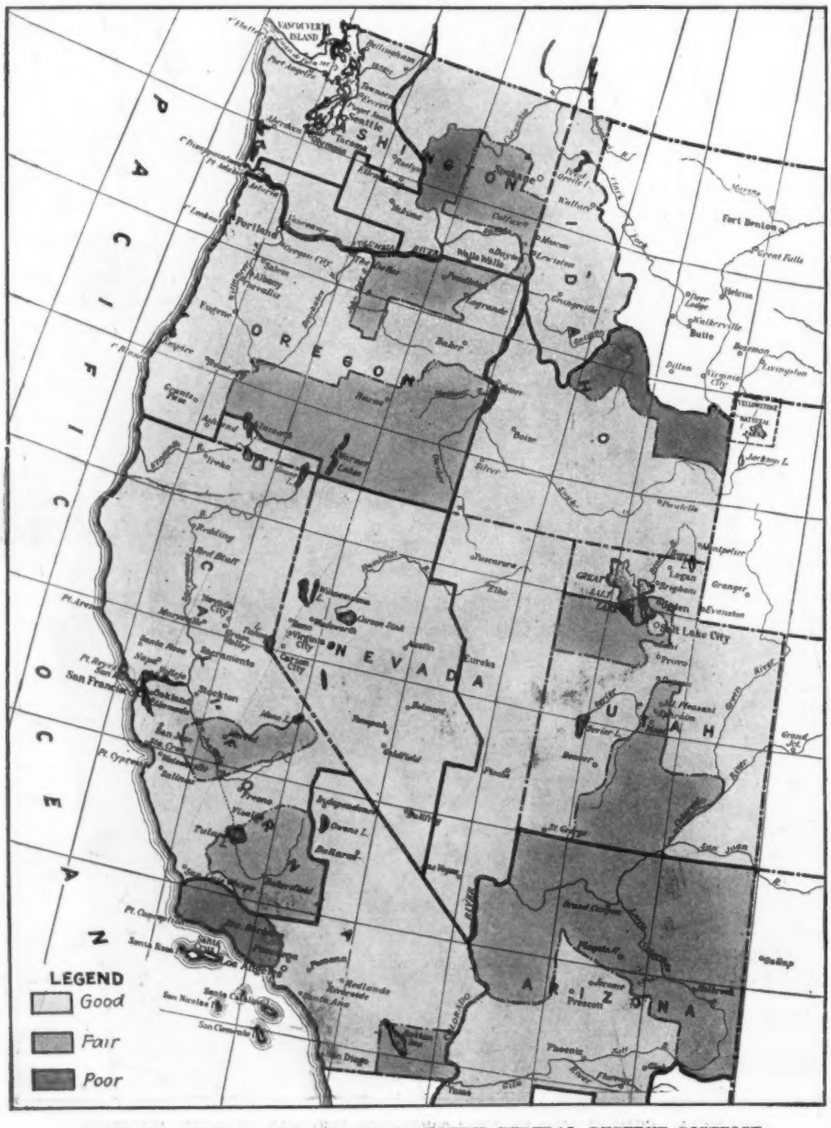

Electric energy total industrial sales
Estimated annual rate of growth, 13.9 %
Sales adjusted for seasonal variation
Corrected debits adjusted for seasonal variation
Estimated annual rate of growth, 6.5 %
Bank debits corrected for price changes
Electric Energy Scale, Millions of Kwhr.
Bank Debits Scale, Billions of Dollars
1921
1922
1923
1924
1925

ELECTRICAL ENERGY SALES COMPARED WITH GENERAL BUSINESS

A comparison shows that the annual growth of the electrical industry is more than double that of the growth in general business. The figures are based on the bank debits of twenty of the largest Western cities and the energy sales of the twenty principal power companies.

still displaying that capacity for rapid growth which is a characteristic of desirable new lands. Whereas the normal annual rate of growth in total volume of business in the United States is, as has been authoritatively estimated, approximately 3.5 per cent, the normal annual rate of growth in the seven states (Arizona, California, Idaho, Nevada, Oregon, Utah and Washington) which comprise the Twelfth Federal Reserve District is approximately 6.5 per cent. This is not surprising. As a country approaches the point of complete utilization of all available natural resources, the growth curve tends to subside until the upward movement is hardly perceptible. The growth curve for the United States has already begun to feel the effect of this flattening-out process, while the growth curve for the Western States is still in an earlier phase of rapid and steep ascent.

The supply of power for agriculture and industry must keep pace with the development of this fast-growing territory, a task requiring, above all, vision and faith in the future. The electric power industry has not failed in its mission. Computations based on the reports of 20 principal power companies in the seven most western states indicate that increases in sales of electric power for industrial purposes have recently been at the rate of 13 per cent per year, or more than twice the rate of increase in total volume of business. This means that electric power has not only been made generally available in response to the growing needs of the communities served but that it has also been adapted to industrial uses where formerly other forms of power were used, or where no power at all was used except that of man and animal. Agriculture, lumbering, mining, flour and feed milling, fruit, vegetable and fish packing and preserving, the metal trades—all of the basic industries of the Western country have come to electricity for aid in solving their problems of economical production.



FINANCIAL CONDITIONS IN THE TWELFTH FEDERAL RESERVE DISTRICT AS OF DECEMBER 31, 1924

A study of general business conditions in the West indicates that the faith of the power companies in the progress of the territory has been justified. In good times and bad—and there have been both, especially since the collapse of the post-war business boom of 1919-1920—the power companies have gone forward with development projects which were dependent upon steady future growth of consumptive needs for their profitable utilization. During 1925 in California alone the central-station companies will spend upward of one hundred million dollars for new development.

While no confident predictions or forecasts concerning business activity over a period of years may well be made here, it is safe to say that, as the accompanying maps suggest, the sore spots in the Pacific States left by the depression of 1921 have been largely eliminated and the conditions necessary for sound, healthy growth quite generally prevail.

Development of Domestic Refrigerator

Seven Years' Experience with 1,000 Machines in Forty-nine Communities—Desirability of Load—Methods of Selling—Analysis of Service Calls—Wider Market Awaits Lower Prices—Commercial Applications

By L. R. Parker

Vice-President and General Manager United Appliance Company and Electric Shop Company, Jackson, Mich.

THIS company's experience in the sale and service of domestic electric refrigerators extends over a period of seven years, during which time approximately one thousand machines of three different makes have been placed in the homes of residential customers in forty-nine cities and towns of Michigan, Illinois, Indiana and Ohio. The districts in which we operate, in conjunction with the central-station offices, vary from 5,000 to 225,000 in population, the average being approximately 40,000 population, with 10,000 electric meters.

The first machine which we handled used sulphur dioxide as a refrigerant, was water cooled and was fairly satisfactory when operated by hand control, but gave continual trouble when automatic control was attempted. Because of the excessive servicing expense, unsatisfactory operation of thermostatically controlled switches and lack of profits on sales, the manufacturer of this machine failed. Prior to this, however, the excessive service requirements on the control and the lack of co-operation from the manufacturer led us to change to another machine, also using sulphur dioxide for a refrigerant but air cooled. This machine has been constantly improved and after considerable trouble with motors, thermostats, expansion valves, idler pulleys, etc., now gives fairly successful operation, although trouble is being experienced through brine action on the tanks of machines that have been in operation for a number of years. The manufacturer of this machine at first gave full co-operation and endeavored to assist in building up sales, but later abandoned this policy.

When the machine now handled was developed, its many advantages were at once apparent—pressure control, an odorless, safe and non-corrosive refrigerant, alcohol solution in the tank, and improved pistons, valves, stuffing box and idler pulley on the compressor constituted forward steps in electric refrigeration. We took over the sale of the new machine after exhaustive tests of more than a year's duration had proved its serviceability. After more than two years' sale of the machine we are well satisfied with its operation. During the first year trouble was experienced with the motor and with the refrigerator itself, but these troubles have been eliminated, and the manufacturer has been as willing as we are to see that our customers were entirely satisfied.

There can be no question that electric refrigeration is satisfactory to the residential customer and that it is an ideal load builder for the central station. It is to a large extent a summer load and differs from other electrical appliances in that it uses energy during the night. In fact, if a sufficient number of machines are sold to give any amount of diversity, their combined load curve becomes almost a straight line. With an average running time of eight hours per day, and taking into consideration the fact that no expenditures are necessary for additional transformer, line, service or meter equipment, I know of no other appliance that is more profitable for the central station. In addition to its value as a revenue producer, it constitutes one of the many benefits to the housewife that tend to make her more satisfied with and dependent upon electricity.

Central-station executives must realize that electric refrigeration is in its infancy so far as the general public is concerned and that the sale of these machines requires and for some years will require a vast amount of publicity and educational work, necessitating a considerable expenditure of money on the part of some one before sales in any volume can be obtained. The manufacturers, due probably to their high production and sales costs in proportion to their sales, either cannot or will not give the dealer a sufficient discount to meet educational and selling costs and are not willing to assume these costs themselves. In cities of the size in which we operate the discount is not sufficient of itself with the present volume of sales to pay the salesmen a living wage and leave anything for advertising, overhead and profit. Therefore, if it is agreed that electric refrigeration is now satisfactory, that it is a benefit to our customers, that it is a load builder, that the manufacturers cannot or will not give a sufficient margin of profit and the dealer cannot afford to sell, it becomes incumbent upon the central station as the only other interested party to bear the necessary expense of pioneering this development.

PRESENT MARKET

The sale of refrigerating machines is at present confined to the wealthier people of the community. It is doubtful if we could show one sale to a customer with an income of less than $5,000 per year as indicated by the 1924 income tax reports. This limits sales possibilities to 9 per cent of the population reporting. The market, therefore, would appear limited in comparison with washing machines, vacuum cleaners, etc., the actual time and labor-saving appeal of which, combined with their lower price, permit their ready sale to merchants, clerks and others with small and moderate incomes.

In selecting salesmen, consideration must be given to the class of customer upon whom they will be required to call. As refrigerating machine prospects are well to do and live in good homes, men are selected who can meet them upon an equal footing and not embarrass the company. As they must also talk with architects and contractors and be referred in some cases to stationary engineers, plumbers, etc., they must be good mixers and not afraid to get their hands dirty. Our greatest success has been with men who have had at least a complete high-school education and who wish to fit themselves for a selling career. To obtain men of this description it is necessary to pay salaries on which they can live comfortably, plus a commission to provide the necessary incentive to make sales.

Salesmen should, in addition, possess selling information and know something about installations. We have new salesmen assist on a few jobs, where they learn installation features that will help in measuring up a prospective job, so that when the machine is installed the tank will not fail to go through the ice compartment door, etc.

It is necessary to maintain a close check on salesmen to keep them enthusiastic and working to the best advantage. To give salesmen prospect cards has been found poor policy. Our plan is to have our store manager keep these cards and each morning go over them with the salesmen, selecting those upon whom calls are to be made. It is often claimed by the salesman that because of the prominence of the customer it was impossible to ask for a payment or signed order before installation. However, if it is made an unbroken rule, both payment and order will be readily obtained. Sales in the majority of cases are made to business men, and they usually appreciate business rules.

A curve of our sales by months, Fig. 1, averaged for the last four years shows a gradual increase in business up to a peak in May, when it gradually decreases to December. The sales for the winter months, November to March, are showing a gradual increase each year. This is undoubtedly due to increased effort. Nearly all good prospects for refrigerating machines are year-round users of ice, who are not sold on a money-saving basis, but because of the added convenience and sanitation, so it is reasonable to suppose they can be sold as easily in December as in July.

SALES PLAN

We have a time-payment plan for refrigerating machine sales, the time price being slightly increased over the cash price, the down payment required being 20 per cent and length of contract ten months. This materially encourages sales, although it is seldom that contracts run the full ten-month period. Some customers seem to prefer purchasing on contract, possibly with the thought that in event of unsatisfactory service the machine may be returned before the full price has been paid. However, soon after the machines are installed and running, most customers complete their payments and take advantage of the discount.

We have no difficulty in obtaining prospects in cities of the size in which we operate. Any number of our employees can name or give the location of homes of persons who will most likely purchase. Architects are cultivated and the builder or owner of every new home is solicited. Addresses before women's clubs are productive of a large number of good prospects. Satisfied users, however, are our greatest asset. New owners will, because of the novelty, show the machines to all of their friends, and if our salesmen can get on sufficiently friendly terms the names of these friends, together with a report of their expressions in regard to refrigeration, are obtained. Many salesmen cultivate

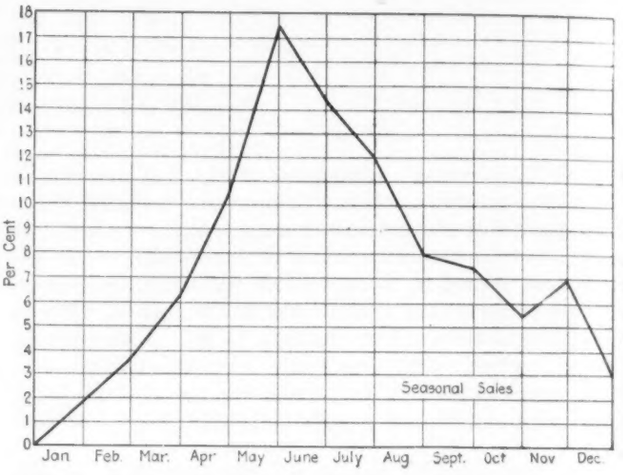


FIG. 1—REFRIGERATION MACHINE SALES BY MONTHS IN PER CENT OF YEARLY SALES—AVERAGED FOUR YEARS 1921-1924

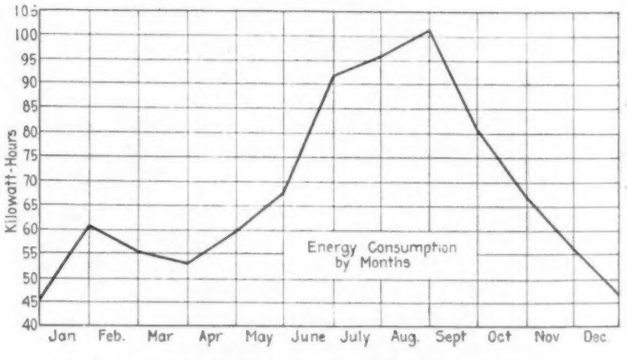


FIG. 2—AVERAGE MONTHLY ENERGY CONSUMPTION OF DOMESTIC ELECTRIC REFRIGERATORS

the local representatives of oil-burner manufacturers, as the latter's prospects often express themselves as desirous of purchasing a refrigerating machine. Members of the medical fraternity are found the easiest customers to sell and when once sold remain enthusiastic boosters. This is not difficult to understand when it is considered that the preservation of food and the prevention of germ development form the basis of our selling talk.

The advertising of electric refrigerating machines must be considered in two ways: First, that which is intended to inform the general public that reliable machines exist, are satisfactory and can be purchased; second, advertising intended to result in actual sales. The first class of advertising consists of newspapers, theater and society programs, theater slides, window displays, exhibits at local fairs, own-your-own-home shows, etc., where individual circulation would be excessively costly in comparison with the actual prospects or sales obtained. A certain amount of this form

of publicity is necessary, as it produces word-of-mouth advertising, which eventually produces sales. The advertising that brings actual sales consists of a good, attractive, well-written individual letter with which is inclosed an attractive piece of illustrated printed matter telling the sales story. These letters are confined, because of their cost, to actual prospects. We never neglect to take advantage of the opportunity to display a machine in electrical homes. Persons who visit these homes are interested in the service electricity can give and so include a number of good prospects.

SELLING PRICE INCLUDES INSTALLATION

Free trials are another source of sales. When prospects are really interested, permission can often be obtained to install in their homes complete units, consisting of machines and refrigerator. The machines are left for one to two weeks in order that the prospects may become familiar with their operation and the many advantages of electric refrigeration over melting ice. It is not difficult after this free trial to sell the prospects either complete units or machines to be installed in their own refrigerators. With the complete units now on the market, there is very little cost to this free trial, as it is simply a matter of delivering the machines and connecting them to a flush receptacle or light socket.

Considerably less sales resistance has been found by selling machines at a flat price installed and operating in the home. Some years ago we tried the method of charging a fixed price for the machine plus installation at cost. Many customers seemed to question this method, so a change was made to a flat charge averaged over a number of installations and included in the cost of the machine. This makes it considerably easier for the salesmen. With a separate charge for installation, which cannot be determined until the work is done, customers are buying without knowing the amount of money they will have to spend eventually. The salesmen really have to make two sales, one of the machine and the other of the installation. Our experience has shown the latter to be the more difficult.

PROPER INSTALLATION IMPERATIVE

Installation is probably the most important factor in refrigerating machine sales, and if properly done will eliminate much service work and dissatisfaction of customers. Without proper installation, constant trouble may be expected until the work is entirely gone over and defects corrected. We have found in nearly every case that where a machine required an unusually large amount of servicing it was due to carelessness or ignorance in installing. Therefore the selection and training of the installation men must be most thorough. These men should first of all be expert mechanics who take pride in their work. They should be polite, clean and able to meet customers and talk to them in an intelligent manner about the machine's operation. Customers are often intensely interested in the installation and probably bother our installers by hanging around and asking what may seem like foolish questions. Installers must therefore be able to satisfy the customers' curiosity and retain them as friends of our company. They must have at least one and preferably two weeks' instruction at the factory, where they will have an opportunity to see the machines built, assist in their assembling and in making a number of installations. Without such instruction it is doubtful if men can be successfully trained to install refrigerating machines, no matter how good mechanics they may be in other lines. We have found it a good practice to have our salesmen, who perhaps are most vitally interested (since it is their bread and butter), check over all installations while they are being made and at the time of starting up the machine.

In installing machines, the compressor and motor should if possible be placed in the basement, because of the better cooling there obtained with air-cooled machines and because of the noise. The best machines have a hum, which will be a source of annoyance to some customers, but even if this is not objectionable, the customer hearing the machine may believe it is running all of the time.

OPERATING COSTS

To the class of customers who purchase refrigerating machines, the cost of operation is negligible, and yet this point may be brought up during the sale and it is well to have some authoritative data on the subject. The following, applicable to this class of business in the majority of our cities, is the regular lighting rate:

Ten cents gross or 9 cents net for first 30 hours use of active load.
Seven cents gross or 6 cents net for next 30 hours use of active load.
Four cents gross or 3 cents net for all over 60 hours use of active load.
Active load is determined:
80 per cent of first 500 watts connected.
60 per cent of all over 500 watts connected.

All electric appliances, including refrigerating machines, are excluded from connected load.

A survey of the billings of electric refrigeration customers shows an average yearly consumption for refrigeration of 840 kw.-hr. The net rate earned by the refrigeration machine will average 3 cents per kilowatt-hour. The consumption by months on various machines will have a wide variation, even though the refrigerators may be of the same size. This is due to a number of causes, among which are insulation, condition and location of the refrigerators, location of compressors, outside temperature, number and duration of door openings, amount and temperature of food, and period machines are not operating, due to absence of owner on vacations, etc. We have installed separate meters on a number of machines; the readings of a few of these from five different cities have been plotted on a curve, Fig. 2, showing the average monthly energy consumption. As this covers a considerable number of installations, we believe it is fairly accurate. From this curve it can be noted that the consumption during the winter months is approximately 50 per cent of that during the summer.

SERVICING NOT TO BE AVOIDED

Electric refrigeration is accomplished by means of a machine and, like any other machine that has ever been built, will require service, especially when operated as a household appliance. Even electric irons, which, in comparison with refrigerating machines, typify simplicity itself, require service and repairs when placed in the hands of the housewife or servant.

Such being the case, it would be foolish to assume that any machine comprising a motor, pulleys, compressor, gears, valves, heat control and air, gas and water-tight joints could be made trouble-proof.

Considerable trouble has been experienced by manufacturers accepting the word of a motor manufacturer and adopting a motor that was not satisfactory for this service. We have been through this twice with nationally known motors and are of the opinion that there is at the present time only one motor which will properly handle this load. Considerable development work on refrigeration motors is yet to be done by the manufacturers, as the present motors are far from satisfactory in regard to efficiency and power factor.

One of the greatest troubles experienced, and one due to faulty installation, is that of leaks. With sulphur dioxide as a refrigerant this is immediately evident by the odor, which, if a sufficient quantity of the gas escapes, will force every one out of the house. This gas will kill any shrubs or flowers with which it comes in contact and service men should not attempt to clear out cellars by opening a window in front of a flower bed or shrubbery. Methyl chloride, while odorless and safe, is extremely difficult to detect for leaks, in a number of cases the only notice of a leak being the continued starting and stopping of the machine.

A record has been kept of all service calls. A compilation of these records on over 450 machines that have been in operation for from one to six years is shown in the accompanying table.

RECORD OF SERVICE CALLS

Discrepancy between total service calls and itemized service calls due to fact that more than one trouble was handled on same service call.

	Total	Per Machine Installed
Service calls per year	1,440	3.20
Service calls on automatic control	387	.86
Belts	216	.48
Fuse trouble	188	.42
Expansion and float valves	186	.41
Piping leaks	183	.41
Burned out or exchanged motors	127	.28
Compressors	120	.27
Idler pulleys	68	.15
Leaking tanks	61	.14

The accompanying list, while not covering all of the trouble we have experienced, includes all of our major servicing. In addition to these calls our service men make inspections of the various machines when oiling, and minor adjustments may be made but not recorded.

In regard to the type of men to employ and their training, we use our service men to make installations and can only repeat what has previously been written about the installers and installations. When service is required, it is imperative that service men be available immediately. Even though electric units will give continued refrigeration for twelve to twenty-four hours after they have ceased running, the customers, not knowing the cause of the trouble and with little knowledge of mechanics, consider it a serious matter. If the service men arrive within a reasonably short time and start the units functioning, the customers will assume the trouble was trivial, no matter how serious it actually may have been.

Manufacturers, while not now obliged to spend enormous sums in the improvement of the machines and exchange of defective parts, should apply such economies toward the very necessary reduction in price. Prices will have to be very materially reduced if a large volume of sales is to be obtained—in fact, it will be necessary, in our opinion, to get down considerably below a $200 cash price, installed, before we can look to any great number of lighting customers as refrigeration prospects. Even such reductions will open up as prospects only persons with incomes of from $3,000 to $5,000 per year, or approximately 15 per cent of the incomes reported in 1924 income tax reports. However, this is an increase of 175 per cent and one that is well worth consideration. Whether or not manufacturers can produce their machines to sell at this price and give dealers a better margin of profit is something to which they should give most serious consideration. In this direction lies the solution of volume sales, or, in fact, of any sustained sales once the present 9 per cent market has been saturated.

A number of manufacturers are trying to tap this greater market by reducing the size of their machine or by reducing the size of the complete unit refrigerator to approximately 5 cu.ft. While this method may be a solution in the large cities where there are many large apartment and duplex houses, it does not help matters in the smaller cities and towns. Apartment dwellers are used to small rooms, ranges, refrigerators, etc., and have learned to conserve space. However, in the cities we serve there are few apartments and the customers whom we are trying to reach live in separate residences and are so used to having plenty of room for everything that they will not be satisfied with a small refrigerator which will only hold approximately two days' supply of food.

PROBLEMS OF COMMERCIAL APPLICATIONS

In addition to the residential market, which has been discussed here, there is also a large field for small commercial machines for grocers and butchers and for machines adapted for ice-cream cabinets and soda fountains. The present domestic machines will handle a box up to approximately 50 cu.ft. contents if used under ideal conditions. The average grocer or butcher with whom we come in contact is asking for mechanical refrigeration, but his refrigerator will run from 50 to 100 cu.ft., with the average probably around 80 cu.ft. The machines at present on the market applicable to this purpose are both too large and too expensive for these prospects, but if a machine capable of handling up to 100 cu.ft., with automatic control and selling, installed, for around $500 can be produced, there should be no difficulty in obtaining a large number of sales.

In the cities where we operate the market for ice-cream cabinet and soda-fountain machines is small, compared with metropolitan districts. Ice-cream manufacturers are investigating this matter very thoroughly and, due to the reduction in delivering and servicing cost, will undoubtedly supply their dealers with machines on a rental or low-cost basis. In addition to the operating saving, this permits tying up the retailer for a number of years. Because of the large number of machines required and their tendency to shop around, ice-cream manufacturers will undoubtedly purchase machines at a price that will exclude all dealer's or central-station's profit. However, use of electrically refrigerated ice-cream cabinets makes a most desirable load for the central station company's circuits.

Central Station and Industrial Practice

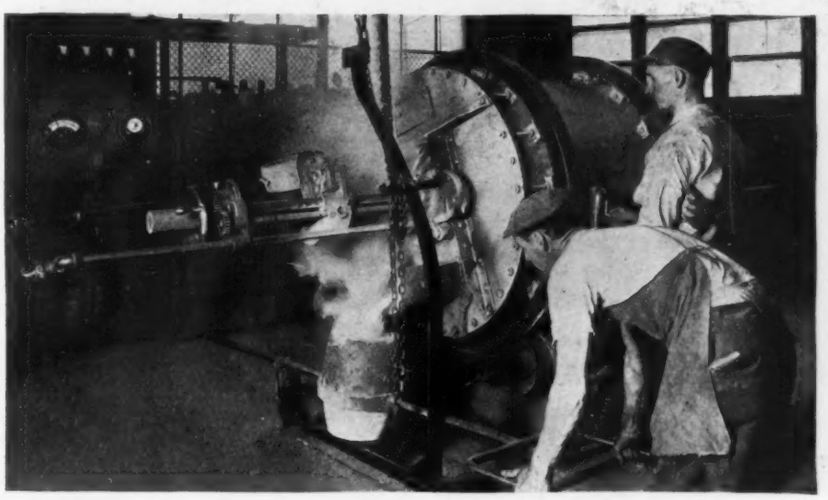
Steel Towers for Canal Crossing Span

TWO 230-ft. steel towers erected by the Puget Sound Power & Light Company, Seattle, Wash., for carrying transmission lines over a ship canal in the city of Seattle are shown in the accompanying illustration. The crossing was designed to carry a maximum of twelve No. 4/0 seven-strand hard-drawn copper conductors with 7-ft. horizontal and vertical spacing.

Four three-phase circuits of a maximum of 55,000 volts are planned for the future, two of which will be erected for the present. These lines are designed to bring power into Seattle from the Beverly Park substation, about twenty-five miles out of the city, where it is stepped down from the 110-kv. transmission lines from the Baker River development.

The length of the crossing span is 478 ft. and the height of the towers approximately 230 ft., providing a minimum clearance to the lowest conductor over the ship canal of 200 ft. The conductors were strung with a sag of approximately 30 ft., producing a maximum tension of 2,000 lb. on each under heavy loading conditions as specified in the National Safety Code. Due to the moderate span length and stresses, no special provisions were made at dead-ends. Four disk strings were used for the dead-ending crossing span and the lead-off to adjoining poles.

STEEL TOWERS 230 FT. HIGH CARRY FOUR 55-KV. CIRCUITS OVER SHIP CANAL



BOOTH ROTATING ELECTRIC FURNACE POURING HEAT IN BRASS FOUNDRY

Electric Furnace for Rapid Melting of Brass

A ROTATING furnace installed in an Eastern foundry has melted and poured a 600-lb. charge of red brass scrap in forty minutes. The demand for greater speed in melting is being met by electric furnaces with the result shown above. Central-station power and heating engineers should feel no hesitancy in recommending electric brass furnaces for foundries where rapid melting is demanded and where overloads are frequently required of the furnace.

The Enterprise Brass Works of Muskegon, Mich., is using three "speedy-heat" rotating electric furnaces, two of which have operated for more than three years. The furnaces melt red brass scrap with an average energy consumption of slightly over 300 kw.-hr. per ton when operating on a twelve-hour basis.

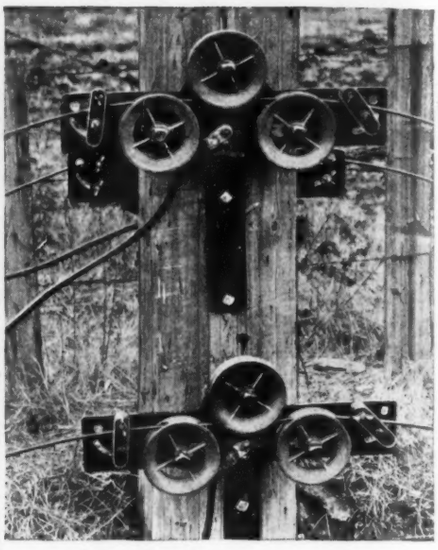
An installation of this class of furnace in another foundry has been featured by the furnace producing more than 2,000 heats without relining. The lining replacement cost has averaged less than twenty cents per ton of metal melted. The overload capacity of this furnace is indicated by the fact that a 250-lb. furnace has been able to melt 470 lb. of red brass scrap.

Grounding Device Reduces Hazards to Workmen

BY A. G. CARSON
Manager Wisconsin Public Service Corporation, Green Bay, Wis.

WHENEVER wire is strung under or near a high-voltage line the Wisconsin Public Service Corporation uses the grounding device shown in the accompanying illustration. This device keeps the wires being strung well grounded and greatly reduces hazards to the workmen.

It is made up of three 6-in. trolley wheels mounted on a $\frac{1}{8}$-in. boiler plate with center wheel adjustable to vary the tension according to size of wire. Two roller type leaders are



GROUNDING DEVICE USED BY WISCONSIN COMPANY WHEN STRINGING TRANSMISSION LINES

used, so arranged that by loosening a wing nut wire may be slipped in or out without having to pull the end of the wire through it. Supporting iron is drilled for two ⅜-in. U-bolts and for two ½-in. lag screws. The first choice is to attach the device with two U-bolts to a standard 1-in. ground pipe driven in ground in line with direction of pull. Another pipe is driven in the best grounding location near by and a ground bus carried from it to a grounding device. If a good water pipe ground or another artificial ground is available we use it instead of driving an additional ground pipe. This, we feel, gives us a reliable ground connection, and the device is also very flexible mounted in this way.

In some cases where the ground is frozen and a good permanent ground is available, it is more practical to attach the device to a pole or fence post with two ½x4-in. lag screws and connect it to permanent ground with the ground bus only. We use this device with bare or insulated wire. With the latter we ground the inside end of the coil.

Insulating Oils

THE specifications and application of insulating oils given in this table have been adopted by the Utica Gas & Electric Company as its standard practice.

SPECIFICATIONS AND APPLICATIONS OF INSULATING OILS

Apparatus	General Electric Oils: Ordinary Installations	General Electric Oils: Cold Climate	Westinghouse Oils: Ordinary Installation	Westinghouse Oils: Cold Climate
Transformers	No. 10C transil	No. 10C transil	Wemco A	Wemco C
Current and potential transformers	No. 10 transil	No. 10 transil	Wemco A	Wemco C
Induction voltage regulators	No. 10 transil	No. 10C transil	Wemco A	Wemco C
Mercury-arc rectifiers	No. 10 transil	.....	Wemco A	.....
Lightning arresters	No. 6	No. 6	Wemco A	Wemco A
Oil circuit breakers	No. 6	No. 21	Wemco A (indoors)	Wemco C (below O C)
Starting compensators	No. 6	No. 21	Wemco A	Wemco C
Time delay relays	No. 21	No. 21	.....	.....
D. & W. oil fuse cutouts	No. 21	No. 21	.....	.....

Specifications

	G. E. No. 6	No. 10 Transil*	No. 10C Transil†	G. E. No. 21	Wemco A	Wemco C
Flash point	185 deg. C.	140 deg. C.	133 deg. C.	155 deg. C.	140 deg. C.	149 deg. C.
Burning point	210 deg. C.	155 deg. C.	150 deg. C.	180 deg. C.	154 deg. C.	174 deg. C.
Freezing point	—10 deg. C.	—5 deg. C.	—30 deg. C.	—30 deg. C.	—2 deg. C.	—40 deg. C.
Viscosity at 40 deg. C.	105 sec.	52 sec.	52 sec.	100 sec.	50	110 (Saybolt test)
Color	Dark amber Clear	Pale amber Clear	Very pale amber, clear	Dark amber	Very light	Light

Note: * No. 10—Refined from Pennsylvania crude. † No. 10C—Refined from Western crude.

When to Replace Old Transformers

BY CAPITALIZING losses in old transformers and what could be obtained by selling them, the Dallas Power & Light Company has developed a pair of curves that indicate the limit in losses for different sized transformers beyond which it is economical to scrap the old units and buy new ones.

The total permissible loss curve is based on the transformer prices given in the table in the illustration. If market prices and losses vary from the values indicated, changes should be made in the permissible loss curve to allow therefor. For example, an old transformer should be removed from continuous operation if the excess loss in watts is greater than 93 per cent of the price in dollars of a new transformer of equal capacity rating.

The curves are based on the fact that $E = aT/R$ where E is the equity or cost of a new transformer in dollars, R is the rate of interest, a is the annual excess cost of operation, T is a term factor which at 8 per cent interest and fifty years' life equals 0.97868. Therefore the excess loss in watts $= (E \times 0.08 \times 1000) \div (0.01 \times 8760 \times 0.97868) = 93$ per cent times E.

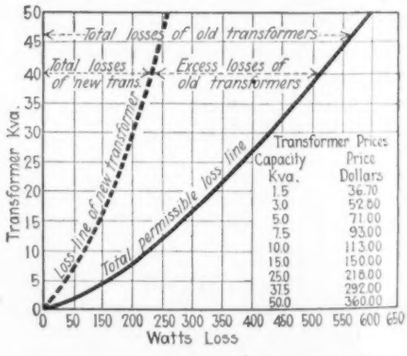


CHART FOR DETERMINING WHEN TO SCRAP OLD TRANSFORMERS

Commercial Activities and Public Relations

Utah Company Holds Annual Electric Washer Sale

AS A PRODUCER of revenue from increased energy sales the electric washing machine can not, of course, be classed with the electric range, refrigerator or even the flat-iron, but in relieving the housewife of arduous, back-breaking labor it is probably the greatest of the electrical appliances. For this reason, and because it typifies the possibilities of electrical convenience, many central-station companies recognize that the sale of an electric washer is one of the best means of educating the public and paving the way for the use of other appliances in the home.

Following out this policy, the Utah Power & Light Company has for a number of years made it a practice to hold an annual sale of washers, offering special inducements to customers to buy machines on long-term payments. This year in the sale of 1,265 machines during its March campaign the company established the second highest sale in its history. This figure was exceeded only in 1920, when 1,711 machines were sold. In the face of a fairly high percentage of saturation in some districts and unusually keen competition, the selling of 1,265 machines at retail by the power company is a striking example of results obtained by intensive sales efforts.

In conducting the recent campaign there was very little change from the methods used in former years. The well-known slogan "A copper washer for a silver dollar" was repeated, as its use in previous years has established this phrase in the mind of the public. Newspaper display furnished a large part of the advertising activity. Attractive window displays were featured in all of the company's stores throughout the month. Animated characters were used to good advantage, and frequent changes were made in window arrangement in order to stimulate interest. Banners carrying the campaign slogan were displayed on company automobiles and the street cars.

Direct-by-mail advertising was used in distributing to all of the company's customers the "Automatic Oracle," a novelty designed in such a way that the customer could ask a number of questions regarding the washer and, by means of a magnetized dial and pointer, receive the answer. The backs of billing envelopes were also used to carry a message regarding the campaign. Terms of $1 down and $5 per month were offered and proved to be an important factor in stimulating sales.

A "bogie" of 1,000 machines was set up as a mark at which to shoot, and to each of the company's nine divisions a proportionate part of this figure was assigned. It is a notable fact that every division except one exceeded its quota. That one exactly reached its quota.

Maintaining the interest of the company's employees and also that of the public in an annual merchandising event of this nature has been something of a problem, but it seems to have been solved by the Utah Power & Light Company, as evidenced by the success of these campaigns year after year.

Advertising the Uses of Electric Trucks

FOR about a month the electric transportation division of the sales department of the Edison Electric Illuminating Company of Boston has been sending illustrated post cards of the type reproduced to prospective customers. Each card bears a sentence testifying to the usefulness of electric trucks in the service of a particular user, the testimonial being signed by a responsible officer and indicating his satisfaction with field performance and frequently stating his intention to purchase more units in the future. Thus the cards do by-product advertising for the benefit of the user as well as of the Edison company and the truck and accessory organizations. The cards are sometimes mailed with a handwritten message from the Edison sales force on the front side and sometimes are inclosed in letters. The up-to-date local photographs carry a strong interest as compared with ordinary circularized illustrations.

Develop Group Interest in Commercial Cooking

THOUGH considerable interest has been shown in commercial electric cooking, many sales executives of public utilities have met peculiar sales resistance from the inertia of apathetic prospective customers.

Difficulty in making rapid headway in working on individual "prospects" has deferred some companies from employing specialists in the development of this business because they feel that it would take too long to obtain profitable results. An idea developed in the stimulation of commercial electric cooking in Cleveland is therefore worthy of consideration by new-business executives who are willing to undertake an aggressive, sustained and thorough-going activity in the development of this very desirable load.

The idea followed in Cleveland is that of selling the advantages of the electric heavy-duty cooking to the group first and later to the individual. In the development of the

INTEREST IN ELECTRIC VEHICLES IS STIMULATED BY POSTCARDS SHOWING TRUCK FLEETS

commercial electric cooking field there is much work to be done in selling the idea of electric cooking itself before any equipment or electric service can be sold, and it has therefore been found profitable in Cleveland to address the first efforts to interesting a particular group of prospects in the general subject of commercial electric cooking and later taking up the individual requirements of prospects by personal solicitation.

In following up this idea the prospects are classified by nature of business, such as hotels, restaurants, bakeries, hospitals and public institutions. A campaign of education is then started in which each group of prospects is studied and developed as a unit. Arrangements are made for addressing a group of prospects of the same class, at which time the problems peculiar to this class are discussed and the part which electric cooking can take in overcoming present difficulties is exemplified. A real effort is made to sell the idea and the advantages of electric cooking to each group before taking up with individuals the matter of cost of equipment and service to be supplied.

Following the address to the group representatives booklets may be prepared illustrating such installations as are in service accompanied by signed comments of existing users.

The chief merit of this plan of procedure is that it is more economical to break down the sales resistance to the idea of electric cooking by treating prospects in groups than it is to endeavor to convert each individual to the idea. The former method of treatment gives the salesman more time on his personal calls to discuss the application of any particular equipment to particular requirements and affords him an opportunity to avoid generalities, "get down to cases" and bring results.

An Effective Bonus Plan for Sales "Prospects"

IN AN effort to better the merchandise sales of 1924 the Public Service Company of Northern Illinois has adopted a form of commission or bonus for new business obtained whereby all employees of the company may benefit. A schedule of bonuses has been arranged so that employees will receive a commission on all names of prospective customers that are turned in which result in sales.

R. S. D. 11

MORE AND BETTER BUSINESS
Prospect Card

NAME
ADDRESS
CITY

PROSPECT FOR

ELECTRIC				GAS			
CURLING IRON		FACTORY LIGHTING		CLOTHES DRYER		LAUNDRY STOVE	
DISH WASHER		SIGN		IRONING MACHINE		STEAM RADIATOR	
FAN		MOTOR		GARAGE HEATER		KITCHEN RANGE	
FIXTURE		SEWING MACHINE MOTOR		RADIANTFIRE HEATER		HOTEL RANGE	
GRILL		PERCOLATOR		TANK WATER HEATER		RESTAURANT RANGE	
HAIR DRYER		SPACE HEATER (RADIATOR)		STORAGE WATER HEATER			
HOUSE WIRING		RANGE		HOUSE HEATING—			
HEATING PAD		SEWING MACHINE		BRYANT BOILER			
HOT PLATE		SERVEL REFRIGERATOR					
IRON		TOASTER					
SOLDERING IRON		URN					
IRONING MACHINE		VACUUM CLEANER					
KITCHEN UNIT		VIBRATOR					
PORTABLE LAMP		WAFFLE IRON					
STORE LIGHTING		WASHING MACHINE					
WINDOW LIGHTING							

PUBLIC SERVICE COMPANY OF NORTHERN ILLINOIS
EMPLOYE'S SIGNATURE
DATE
DEPARTMENT
INSTRUCTIONS.—Check with (X) appliance customer needs. Fill out in duplicate. Forward both copies to District Chief Salesman. Use reverse side for special instructions.
Debit Ticket No.
Chief Salesman

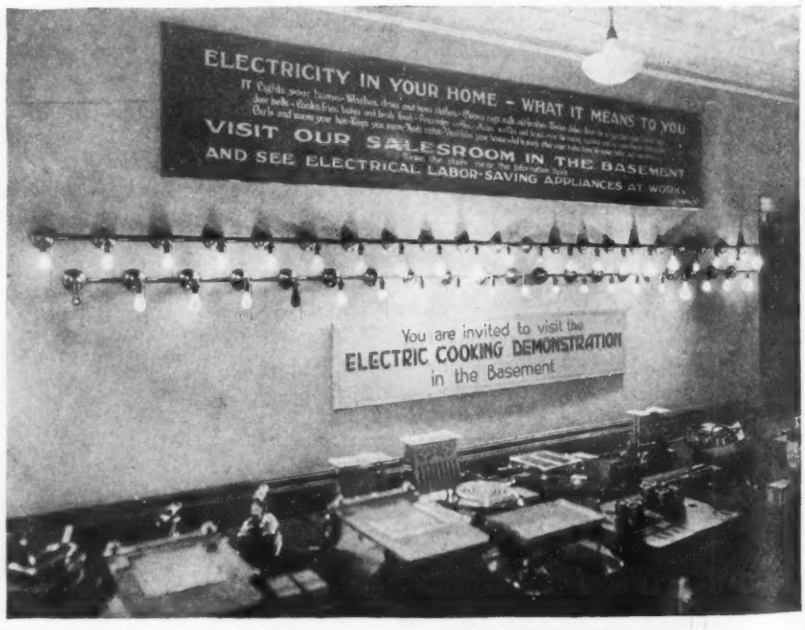
NEW-BUSINESS "PROSPECT CARDS" TURNED IN BY EMPLOYEES

To encourage employees in sending sales tips in to the new-business department the "prospect card" shown here has been prepared and furnished to all the company force. The "prospects" or "leads" are made out in duplicate, and careful record of sales is kept so that there will be no question as to employees receiving their proper commission.

The success of the plan may be judged by the fact that approximately one-half of the names turned in have resulted in the closing of sales, a very high percentage. During the first three months' operation $115,000 of merchandise sales resulted.

"Massed" Advertising of Electric Service

BY UTILIZING the wall space in its main office to advertise various phases of electric service in the home the Manchester (N. H.) Traction, Light & Power Company stimulates the interest of callers and succeeds in creating a striking impression of the value of domestic applications of central-station energy. A sign at the top of the wall celebrates the variety and convenience of electric service, and below this two rows of lamps with chain-pull sockets and designation plates enable the visitor to operate virtually every style and size of lamp. Other appliances are displayed at the bottom.


ELECTRICITY IN YOUR HOME - WHAT IT MEANS TO YOU
VISIT OUR SALESROOM IN THE BASEMENT
AND SEE ELECTRICAL LABOR-SAVING APPLIANCES AT WORK
You are invited to visit the
ELECTRIC COOKING DEMONSTRATION
in the Basement

VARIED USES OF ELECTRICITY ARE ADVERTISED IN SMALL SPACE

News of the Industry

First Two Specials Off

"Red" Leaves New York on Sunday and "Green" Chicago Yesterday Filled with Delegates

BEARING ninety-three executives of lighting, power and other electrical organizations and a total passenger load of 168, the "Red Special" left the Grand Central Station last Sunday afternoon en route for the San Francisco convention of the National Electric Light Association, in charge of R. B. Grove, Eastern traffic manager of the association. Chicago was the first stopover, Kansas City the second and Colorado Springs the third.

RADIO GREETING HEARD ON TRAIN

On Sunday evening a radio message was broadcast from New York by Past-president Frank W. Smith conveying the greetings of the East to the West and dwelling on the triumphs of the industry and the greatness of the continent it serves. This message, which was heard by thousands of citizens, was picked up on the train between Utica and Syracuse, coming through in remarkably clear and distinct fashion over the up-to-the-minute receiving instruments installed by the Radio Corporation of America. It was probably the most successful experiment in radio communication with a moving train yet made in the United States.

Yesterday evening, June 5, the "Green Special," containing eleven private cars, left Chicago in charge of the association's Western traffic manager, Godfrey H. Atkin. Its first stop will be St. Paul and Minneapolis, and it will travel through the Canadian Northwest and British Columbia to Seattle, Portland and San Francisco.

The two remaining special trains, the "Blue" from New York and the "Orange" from Chicago, will leave next week, on Wednesday and Monday respectively, as announced in the last issue.

Southern California Edison to Start New 220-Kv. Line

The Southern California Edison Company has announced its intention of building its third 220-kv. transmission line from Big Creek to Los Angeles. Road construction is to start about September 1, while actual line construction is scheduled to start January 1, 1926. It is expected to have the line in operation early in 1928. Load capacity has been reached on the present transmission lines, and this new line is to provide additional transmission equipment to care for anticipated additions to the company's generating plants on the Big Creek-San Joaquin project. Approximately $11,000,000 will be spent in the construction of the 225 miles of line and the necessary substation and switching facilities. In construction the new line will be similar to the two existing lines. Over much of the distance the line will be carried through mountainous country, making long spans possible. This keeps the average number of towers to the mile down to the remarkably low figure of four and two-tenths.

Muscle Shoals Power Contract Unlikely

Majority of President's Commission Believed to Favor Waiting on Congress—Testing Period May Be Protracted Until End of Next Spring

WITH the idea of discussing and taking action on the letter of the Secretary of War in regard to the disposition of power at Muscle Shoals prior to congressional action to that end, the President's Muscle Shoals Commission will meet in Washington June 10. The Secretary of War wrote the commission on April 14 in regard to the matter and requested an early reply. The delay has been occasioned, it is understood, by the belief of a majority of the commission that no commercial use should be made of any of the power generated prior to its permanent disposition by Congress.

It seems apparent now that power at the new plant will be available so sporadically during the testing period, which will extend from August to late next spring, that no formal contract will be entered into for such power as may be available for sale. The electric contractors in charge of the installation which will convey the power away from the dam have advised the Chief of Engineers that the testing of machinery should be conducted under load and not with water rheostats as has been suggested. They also point out that a temporary installation will advance greatly the tuning up of the plant and can be handled in such a way as to create no additional hazard. In this way it will be possible, it is believed, to test out the four generators which are being installed first. It may require until December 1, or even the first of the year, General Taylor says, to complete the testing of these four generators. It is expected that the switchboard then will be ready for test, after which the four other generators are expected to be ready for testing.

General Taylor believes it would interfere unduly with the completion of the project to be under any commitments or even under implied obligations to give advance notice as to the cutting off of power. He favors an arrangement whereby the tests can be made under the actual load that could be furnished through connection with the lines of the Alabama Power Company. That plan, however, will reduce the return to the government for the sale of the temporary power. With no assurance as to continuity of power it would be necessary for the Southeastern power companies to keep their steam auxiliaries ready for immediate use. Under such conditions these companies probably would be willing to pay for this power nothing more than the equivalent of such saving of coal as would result.

There is some talk in the locality of staging some sort of ceremonial when the first power goes into use, but General Taylor is emphatic in his disapproval of any such course. The ceremonies, he says, will be reserved for the time when all work shall have been completed.

A continuance of governmental development and operation of Muscle Shoals has been declared to be highly desirable and advantageous by William Green, president of the American Federation of Labor. This statement was made in a communication to Representative John C. McKenzie, chairman of the Muscle Shoals Inquiry Commission, in answer to a question as to what President Green believed to be the best disposition of Muscle Shoals. President Green submitted similar statements from James P. Noonan, president of the International Brotherhood of Electrical Workers, and Arthur M. Huddel, president of the International Union of Steam and Operating Engineers.

Colorado River Bond Issue Has Sweeping Victory

The projected bond issue of $2,000,000 "for the acquisition, construction and completion by the city of Los Angeles of a certain revenue-producing municipal improvement, to wit, waterworks," noted in the ELECTRICAL WORLD for May 23, went to the voters on Tuesday, June 2, and was carried by a majority of six to one. As stated in these columns before, this proposition is believed to be the first step in the efforts of municipal water and power advocates in Los Angeles to bring about the construction of Boulder Canyon dam and the generation of power on the Colorado River for distribution to the municipalities of southern California.

Insull Acquires Northern Indiana Properties

The Indiana Public Service Commission has approved the purchase by the Calumet Gas & Electric Company of the Indiana Electric Utilities Company, which serves Angola, Waterloo and several other communities in Steuben and DeKalb Counties in the northeastern corner of the state and other utility properties in northern Indiana. This increases the communities served by the Calumet Gas & Electric Company to seventy-three. Late in 1924 the company purchased fourteen other utility properties operating in northern Indiana. Properties which now become part of the Calumet Gas & Electric Company's system are the C. F. Cain Power & Light Company, which operates two hydro-electric plants near Ontario in LaGrange County; the Hawk Brothers Milling Company, which operates a hydro-electric plant on Pigeon River at Mongo; the Bass Lake Light & Power Company, which furnishes electric service to summer residents to Bass Lake south of Knox; the Nevada Mills Electric Company, which operates a hydro-electric plant at Nevada Mills, and the Orland Light & Power Company, which serves Orland.

The purchase price of these properties was $631,864, and in addition the Calumet Gas & Electric Company will assume the payment of $180,400 of funded debt of the Indiana Electric Utilities Company.

Legal Steps Toward New York's Two Big Mergers

Formal steps in the merger of electric light and power companies serving the Niagara district of New York State have been taken. The application of the Buffalo, Niagara & Eastern Power Corporation to acquire and hold more than 10 per cent of the common stock of the Buffalo General Electric Company, the Niagara Falls Power Company, the Niagara, Lockport & Ontario Power Company and the Tonawanda Power Company has been filed with the Public Service Commission and will be heard at Buffalo on June 10. The new company will exchange its shares for 735,000 shares of the common stock of the Buffalo General Electric Company, 300,000 shares of the Niagara, Lockport & Ontario Power Company, 740,801 shares of the Niagara Falls Power Company and 38,200 shares of the Tonawanda Power Company.

What is apparently the first legal step in the announced consolidation of the principal power and utility corporations serving territory in the western, central and northern sections of New York State and the capital district is evidenced by the filing in the office of the Secretary of State of certificates of incorporation for the Ontario Power Securities Corporation, capital 3,000 shares, non-par value; Lockport Power Securities Corporation, capital 2,700 shares, non-par value; Adirondack Power Securities, Inc., capital 5,000 shares, non-par value; Niagara Power Securities Corporation, capital 2,500 shares, non-par value; Adirondack Stockholders' Securities, Inc., capital 5,000 shares, non-par value, all with home offices at Schenectady, N. Y.

Electric Utilities a Feature of "Transcript" Survey

Prominent executives in the electrical industry were among the contributors to the second annual "Public Utilities Survey" of the Boston *Evening Transcript*, which was published on June 1, widespread recognition being given editorially and in signed articles to the strong position of utility securities and the remarkable outlook for electric light and power companies. Among the contributors of noteworthy articles to this issue were Secretary Hoover, Owen D. Young, Roger W. Babson, Martin J. Insull, General Guy E. Tripp, H. T. Sands, R. H. Ballard, J. E. Aldred and Robert M. Davis, statistical editor ELECTRICAL WORLD.

Washington Water Power Company Buys Plant

Sale of the Nine Mile hydro-electric plant by the Spokane & Eastern Railway & Power Company to the Washington Water Power Company is announced. The Nine Mile power plant is below Spokane, on the Spokane River, and has an installed generating capacity of 20,000 hp. in four units.

A contract will be entered into between the Washington Water Power Company and the railway company for furnishing power for the operation of the railway system for a term of years. The present commercial business will be taken over with the power plant, so that the addition of the Nine Mile power plant will not bring any surplus of power to the Washington Water Power system. The purchase of this plant gives the Washington Water Power Company six hydro-electric plants on the Spokane River aggregating 185,000 hp. The consideration involved in the deal has not been made public.

New Iowa Company Foresees Needs of 80,000 Farmers

The Iowa Railway & Light Company of Cedar Rapids, with a capitalization of $35,000,000, was granted a certificate of incorporation last week. William G. Dows is president, Isaac B. Smith vice-president and treasurer and John A. Reed vice-president and general counsel. Officials of the new corporation said it had been organized for the purpose of taking over the assets and business of the Iowa Railway & Light Company, the Boone Gas Company, the Wapsie Power & Light Company, the Jefferson Electric Company and other utilities recently acquired. It was also said that negotiations are now under way for the purchase of other properties in various localities throughout the state.

The capitalization is divided into $20,000,000 of common stock and $15,000,000 of preferred. The present gross operation income of the various utilities brought into the merger is slightly in excess of $6,000,000 yearly. No change in personnel or place of business will result. The offices will remain in Cedar Rapids, and the officials of the present Iowa Railway & Light Company will hold the same positions in the new corporation. In a signed statement President Dows laid stress upon the fact that his company was an all-Iowa organization and had local interests at heart, particularly the needs of eighty thousand farmers in its territory.

U. G. I. Absorbs Iowa Light, Heat & Power

The United Gas Improvement Company of Philadelphia has announced the acquisition of the Iowa Light, Heat & Power Company, which, with headquarters at Carroll, serves that city and about fifty other communities in northwest Iowa. It had been controlled by the Federal Power & Light Company of Portland, Me.

About six months ago the United Gas Improvement, as announced at that time, consolidated the Northern Iowa Gas & Electric Company and the Waterloo and Cedar Valley electric utilities into the Central Iowa Power & Light Company, with headquarters at Humboldt. With the Iowa Light, Heat & Power the U. G. I. will now control public utilities in Iowa valued at $75,000,000 and serving two hundred towns and cities. Don M. Sterns of Humboldt will be general manager of the consolidated holdings, which extend across the state from Sioux City east to within a short distance of the Mississippi River. The large station under construction at Sioux City to serve the westernly territory, which is rated at 22,500 kw. and will cost nearly $4,000,000, is nearing completion.

Supply Jobbers Hear Wahle, Herstein and Others

The seventeenth annual convention of the Electrical Supply Jobbers' Association, held at Hot Springs, Va., opened with a record attendance on Wednesday, June 3, following two days of committee meetings at which problems in connection with the distribution of jobbers' commodity lines were thoroughly discussed. Features of the Thursday program were addresses by Albert Wahle, New York, on "The Distribution of Lighting Fxtures," W. J. Canada, field secretary National Fire Protection Association, on "Codes and Ordinances" and Joseph A. Fowler, president Association of Electragists International, on "Contractor-Dealer Problems." At the evening session Alvin E. Dodd, United States Chamber of Commerce, discussed "The Present Confusion in Distribution"; W. R. Herstein, Memphis, compared electrical supply dealers' business with other lines, and Earl E. Whitehorne, commercial editor ELECTRICAL WORLD, told about the "James H. McGraw awards," announced last week.

Numerous Preliminary Permits Issued

Hydro-Electric Projects in California, Minnesota, Oklahoma, Alabama, Kentucky, South Carolina and Indiana Get Approval from Federal Power Commission

A PRELIMINARY permit covering a power project on the North Fork of the Stanislaus River in Calaveras County, Cal., has been issued to Pattee, Bernard & Ross of Oakdale, Cal., by the Federal Power Commission. The development is to include a storage reservoir with a capacity of 32,000 acre-ft. The water is to be diverted through a conduit to a power house 11 miles further down the stream.

A permit has been authorized covering a power project on the Mississippi River near Libby, Minn., and involving the construction of a dam across the river at Oxbow Rapids, which will form a reservoir extending up stream 35 miles and overflow 3,000 acres of land. The permit is to be issued to the Prairie River Power Company in St. Paul.

Other permits authorized cover a power project on the Grand River, in Ottawa County, Okla., where the Public Service Company of Tulsa wants to construct a dam across the Grand River 5 miles south of Bernice, a head of 40 ft. being developed; a project on the Cosumnes River, in Amador County, Cal., fathered by Stephen E. Kieffer of San Francisco, who desires to construct a dam 300 ft. high which will form a reservoir of 470,000 acre-ft. capacity, part of the water to be used for irrigation and for municipal water supply in the Sacramento Valley west of the dam, and a project of the Ventura Power Corporation of San Francisco involving a series of developments on Piru Creek, Los Angeles County, including two dams, two storage reservoirs and three power houses.

Coosa River Project Authorized

A permit has been authorized for the People's Hydro-Electric Power Company at Birmingham covering a project on the Coosa River. It is proposed to construct a dam 35 ft. high and 3,000 ft. long below Lock No. 2 at a point near Henry's Island. The reservoir thus created would drown out United States Lock and Dam No. 1 and No. 2, thus improving navigation. The feasibility of this project as an independent development is questioned by the staff of the Federal Power Commission, and, moreover, satisfactory proof of the financial ability of the applicant has not been forthcoming. The applicant, however, holds a certificate of convenience and necessity from the Public Service Commission of Alabama. In addition, approval of the application has been urged by the Governor of that state. The commission therefore voted to grant the permit.

The commission also authorized the issuance of a preliminary permit to the Louisville Hydro-Electric Company covering its project on Green River, where it is proposed to build a dam 100 ft. high a mile above the entrance to Mammoth Cave. On account of the nearness of the cave an alternate site near Munfordville, a point further up the stream, has been provided for use in case investigation should disclose the possibility of flooding the caverns.

Still other preliminary permits have been authorized for the Central Carolina Power Company of Columbia, S. C., to construct two dams in Broad River, one 32 ft. high at Frost Shoals, 7 miles above Columbia, the other 34 ft. high and 16 miles above Columbia; for the Kentucky Hydro-Electric Company of Louisville covering projects at United States Locks Nos. 1 to 7 inclusive in the Kentucky River, the plan being to construct a power house at each of the dams; for the Kentucky-Tennessee Light & Power Company of Bowling Green for a development in Green River, a power house at each of the government dams Nos. 4, 5 and 6 in that river and at Dam No. 1 in the Nirran River, and for John A. Shafer of Indianapolis covering a power project in the Wabash River and the East Fork of the White River, the plan being to reconstruct the government dam in the Wabash River at Grand Rapids, Ill., and to build two dams in the East Fork of White River. One dam is to be built at Hindostan Falls, where a head of 37 ft. will be created. The other dam is to go in at Haysville, where a head of 13 ft. can be obtained.

A project on the Tombigbee River in Mississippi comes under the water-power act, the commission holds. Laughridge & Snyder of Lexington, Ky., have announced their attention of constructing three dams across the East Fork of that river. The commission also finds that the proposed project of the Roanoke-Staunton River Power Company in the Roanoke River and the proposal of the Riverside (Wash.) Irrigation District to build a dam in Okanogan River 8 miles north of Riverside come within its jurisdiction.

In connection with a declaration of intention by George W. Lucas of Washington, D. C., the commission has found that a dam across Broad Run at Bland's Ford in Prince William County, Va., does not involve federal interests. Similar findings were reached in connection with the proposal of the Northeastern Power Company of Milwaukee to construct a dam in the Peshtigo River in Marinette County, Wis., and with a project in the Colorado River near Hot Sulphur Springs, Col. The last-named site is 275 miles above Moab, Utah, which is regarded as the head of navigation on the Colorado River.

Commissioner Shaw Addresses Vermonters

Henry B. Shaw, chairman of the Vermont Public Service Commission, informally addressed the Vermont Electrical Association upon the favorable outlook in the electric light and power industry at the annual meeting of the organization in Montpelier on Wednesday of last week. President D. W. Jardine reported a membership of ninety-one and pointed to constructive work done in the fields of legislation and co-ordination of line construction practice during the past year. For the ensuing year L. C. White, manager Twin State Gas & Electric Company, Bennington, was elected president; F. L. Lovett, manager Montpelier & Barre Light & Power Company, and M. G. Clark, manager Burlington city lighting department, vice-presidents; A. W. Peterson, St. Albans, secretary and treasurer, and W. Lawson, H. Smith, C. A. Slayton, L. A. Bill, G. A. Hunter and W. Belding members of the executive committee.

Why Shawinigan Executive Opposes Power Exportation

In an interview given in Montreal Julian C. Smith, vice-president and general manager of the Shawinigan Water & Power Company, discussed the question of power exportation with special reference to the proposals before the Dominion government for the water-power concession at Carillon on the Ottawa River. Mr. Smith said he considered the exportation of power to the United States must inevitably prove a bad bargain for Canada, because there is no territory along the international boundary where Canadian power can be safely spared. A careful analysis of the future power requirements in the various provinces indicated that it was only a matter of a comparatively few years when domestic needs would absorb all the power that could be economically developed within transmission range of the boundary.

Because he regards the American demands upon the Canadian government as simply the initial move for a gigantic system to take Canadian electrical energy into Boston and New York, Mr. Smith considers that the Carillon site is for the moment the most strategically important source of power in the whole Dominion. He stated that if Carillon power left Canada, American industry would be given its greatest impetus since electricity became the servant of man, with concurrent retardation to Canadian industry.

Agricultural Engineers Will Take Up Farm Power

The outstanding event of the year in the agricultural-engineering field will be the annual meeting of the American Society of Agricultural Engineers to be held at Madison, Wis., June 22 to 25 inclusive. Among the subjects to be discussed which may be of value to persons interested in farm electrification are: "Some Problems in Rural Electrification," by Arthur Huntington, Iowa Railway & Light Company; "The Agricultural Engineer and Farm-Equipment Industry," by Finley P. Mount, president National Association of Farm Equipment Manufacturers; committee report on "Agricultural

Engineering Research," by R. W. Trullinger; "Co-operation with the Farm-Equipment Industry," by Prof. J. B. Davidson, Iowa State College, and F. A. Wirt, Case Threshing Machine Company; "Co-operation with the Electrical Industry," by S. H. McCrory, United States Department of Agriculture, and Prof. B. D. Moses, University of California; "Co-operation in Research," by Prof. L. J. Fletcher, University of California, and Prof. M. L. Nichols, Alabama Polytechnic Institute; "Operation of Wind Electric Plants," by Prof. F. C. Fenton, Iowa State College, and "Present Status of Power Farming," by A. P. Yerkes, International Harvester Company.

New York State Rents Canal Power for $365,240 a Year

Under the terms of bids received by the Superintendent of Public Works last week the State of New York will derive a yearly profit of $135,000 from the sale of 16,000 hp. of electrical energy generated at the state-owned plant at Crescent Dam and Vischer's Ferry on the canalized waters of the Mohawk River. The state had planned to sell the output at this plant to municipalities, but such disposition was found impracticable, and this year the law was amended permitting the sale of the energy to the highest bidder.

The Cohoes Power & Light Company was high with a bid of $174,220 annual rent for the plant at Crescent Dam. The Adirondack Power & Light Company was high with a bid of $191,020 annual rent for the Vischer's Ferry plant. The term of the lease will be for twenty-five years.

The total rental for the two projects will amount to $365,240. Out of this, it s estimated by Colonel Frederick Stuart Greene, Superintendent of Public Works, the state will be required to pay about $65,000 a year for maintenance and operation of each plant. In addition about $80,000 will be paid in interest and sinking-fund charges to amortize the cost of building the plants, which are now nearly ready to operate. "This will give the state an annual net profit of $135,000," said Colonel Greene.

Several concerns invited to bid on the project made no response. These included the Municipal Gas Company of Albany, the Northern New York Utilities, Inc., the Halfmoon Light, Heat & Power Company and the Ford Motor Company of Greene Island.

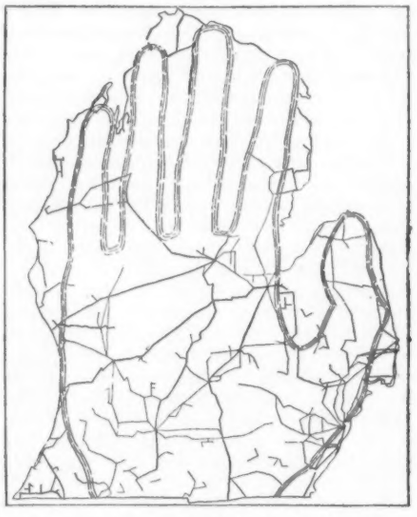
S. P. E. E. Arranges Program for Schenectady

Union College, Schenectady, N. Y., will be the scene of the thirty-third annual meeting of the Society for the Promotion of Engineering Education on June 16-20. Visits of inspection will be made to the plants of the General Electric Company, the American Locomotive Company and the Adirondack Power & Light Company. On Tuesday morning, June 16, there will be a conference on research in the research building of the General Electric Company, which will be participated in by W. R. Whitney, E. H. Colpitts, Prof. A. E. White, Prof. M. S. Ketchum, Dr. G. H. Burgess, R. A. Seaton, Prof. J. B. Whitehead, Farley Osgood and C. E. Skinner. In the evening the board of investigation and co-ordination will meet at the Van Curler Hotel under the chairmanship of Prof. C. F. Scott of Yale.

On Wednesday there will be, among other events, a conference of teachers of electrical engineering under the chairmanship of Prof. H. E. Dyche of Pittsburgh. On Thursday the convention will be formally opened at Union College, with President A. A. Potter presiding. Professor Scott will report for the board of investigation and co-ordination, and W. E. Wickenden, director of investigations, and others will follow him, the whole day being devoted to the subject. On Friday S. A. Lewisohn, Dr. Ira N. Hollis, F. C. Pratt, Charles S. Howe and A. I. Lipetz will discuss the relation of engineering education to industry. In the evening the annual dinner will be held, when President Potter will make an address on "The Engineering College—Its Opportunity for Service." Saturday there will be an all-day excursion to Lake George.

Novel Prize Contest of Michigan Association

The Michigan Electric Light Association has announced a prize advertisement-writing contest under the heading "Read Michigan's Palm" as a feature of the 1925 State convention to be held at Mackinac Island, June 25-27. The contest is open to every man and woman employed by an electric light and power company of Michigan. A map of the



USING THE MAP TO BOOST ELECTRIC SERVICE

lower peninsula of the State of Michigan, drawn to resemble the human hand, forms the basis for the contest, the "lines" in the "hand" being the electric transmission systems. Contestants are not restricted in any manner as to treatment, length or number of advertisements they submit. All advertisements are to be sent to Herbert Sylvester, secretary-treasurer of the association, Ann Arbor, Mich., not later than June 10. The first prize is $20, the second $10 and the third $5.

London's Big New Station

One-half of the First of the Three 200,000-Kw. Sections Has Just Been Opened

LONDON'S latest power station—that at Barking—which has been erected by the County of London Electric Supply Company, Ltd., was formally opened by King George on May 19. The station, which is on the River Thames at Creekmouth, Barking, a few miles below London Bridge, has a river frontage of 2,100 ft., affording unlimited supplies of condensing water, and is capable of accommodating a superpower station with a total capacity of 600,000 kw., divided into three sections of 200,000 kw. each, of which one-half section is now completed.

The buildings consist of the engine and boiler houses, set at right angles to each other, and the switch house, control room and general offices, contained in one block parallel to the engine house. The jetty and river works are of considerable dimensions and will allow at the present time oceangoing steamers of 3,000 tons to come alongside, with an ultimate capacity for more than 5,000 tons.

The electrical equipment of the present half section consists of four turbo-generators, ten water-tube boilers, two reheater boilers, a deep-water jetty with coal-discharging cranes and conveyors, step-up transformers and remote-controlled electrically operated switch gear. The turbines consist of two rated at 15,000 kw. each and two of 35,000 kw. each. They are designed to give a maximum flexibility, the alternators and condensers being interchangeable.

The boiler house is under the special control of a combustion engineer, so as to insure the highest possible efficiency and the lowest operating costs, and to assist in this the station is equipped with a chemical laboratory under a qualified expert. Automatic regulation of the power-house plant and switchgear has been brought to a high state of efficiency. The coaling and ash-handling arrangements are entirely automatic, and coal can either be discharged direct from the steamers into the boiler-house bunkers or temporarily stored between the jetty and the power house.

The main transmission lines connecting the Barking power house with the London area consist of 33,000-volt mains. They are laid underground to three new substations in the London area and through these connect up with existing stations and substations.

The contracts were placed on exceptionally favorable terms—probably the lowest since the war—with the result that the capital cost per kilowatt of the new power house is below that of any other station in Great Britain of comparable size erected since the war.

Briefer News

Philadelphia Club Visits Harrison Lamp Works.—The Electric Club of Philadelphia on Wednesday, May 27, visited the Lighting Institute of the Edison Lamp Works of the General Electric Company at Harrison, N. J. The Philadelphia Electric Company sent representatives and also had as its guests a number of engineers and architects. The group, consisting of 160 persons, journeyed from Philadelphia to Harrison by special train.

Northern New York Utilities to Build 27½ Miles of 110,000-Volt Line.—The Northern New York Utilities of Watertown has petitioned the New York Public Service Commission for authority to construct a high-tension transmission line from its switching station at Taylorville on the Beaver River to its substation at Black River, a distance of 27½ miles, and to install necessary switching and lightning-arrester equipment at Taylorville and Black River. The proposed line is to be a two-circuit, three-phase, 110,000-volt steel-tower line. The estimated cost of the construction is $498,408.

Three Months' Operation Under Reduced Rates Shows Increased Net Earnings.—The first three months of operation of the Potomac Electric Power Company of Washington under reduced rates has resulted in increased net earnings over the corresponding months of last year, according to the monthly reports filed with the Public Utilities Commission of the District of Columbia. This increase is ascribed to several factors such as a reduction in the price the company pays for coal, a reduction in the amount provided for depreciation, in accordance with the valuation agreement and a growth in the number of customers and in the energy used.

New Petitions of Northern New York State Companies.—A petition filed last week with the New York Public Service Commission by the Champlain Electric Company and the Plattsburg Gas & Electric Company asks consent to the transfer by the Champlain company of its franchises, works and system to the Plattsburg company. At the same time the petition of the Associated Gas & Electric Company for consent to purchase the stock of the Champlain company was withdrawn. The Chasm Power Company asks for approval of the exercise of a franchise in the town of Constable, and the Champlain Electric Company for approval of a franchise in the town of Altona.

International Paper Company Disposes of Its Interest in Grand Falls (N. B.) Site.—The International Paper Company has disposed of its rights to the Grand Falls power site situated on the St. John River in New Brunswick. For several years it has been a two-thirds owner of the development rights of this site, where the province now plans a development approximating 50,000 hp. on a public ownership basis. It is believed that the offer of the government for the paper company's rights, while slightly lower than had been expected, was accepted by the company in order that this site, which had long been unproductive, might be developed.

Pacific Gas & Electric Floodlights Its New Office Building. — The recently completed seventeen-story office building of the Pacific Gas & Electric Company in San Francisco, of which a picture was printed in the ELECTRICAL WORLD for April 11, page 790 presents a striking appearance at night with the floodlighting system just completed. The Market and Beale Street faces are lighted up to the fourteenth floor by two batteries of projectors, installed on low buildings across the streets. On the Market Street side thirty-six 1,000-watt projectors are used and on the Beale Street side there

are twenty-six projectors of the same size. Sixty-three 1,000-watt projectors are installed on the building itself to floodlight from the fourteenth to the seventeenth floor, as shown herewith. These are in two rows, one on the ledge on the fourteenth floor where the pillars begin and the other on the ledge above the pillars. When all of the lights are burning the average intensity on the building is approximately 10 foot-candles. A number of combinations of white lighting are possible, and the lighting is varied from night to night to produce different effects.

Stanislaus Plant Will Generate 30,000 Hp.—Under the co-operative agreement ratified by the voters in the Oakdale and South San Joaquin Irrigation Districts, as reported in the ELECTRICAL WORLD last week (page 1145), the Pacific Gas & Electric Company will build a 30,000-kw. hydro-electric plant, to cost $1,500,000, on the Stanislaus River near Melones, Cal., and will pay for water an amount aggregating $5,175,000 over a forty-year period, or approximately $125,000 a year, an amount sufficient to meet all interest and retirement payments on the bond issue of $2,200,000 approved by the voters to build the dam and reservoir. After the power company has made the payments stipulated it will bear half the expense of maintaining the storage facilities. A 210-ft. dam of 112,000 acre-ft. capacity is to be built across the river. The power house, a mile further down, will be connected with the dam by a tunnel so built as to take the greatest possible advantage of the head available. The dam is to be built immediately, but the date for completion of the power plant has not been set.

Duke Interests Contemplating Raising Output of Their Quebec Plant to 1,000,000 Hp.—According to a report from the city of Quebec, plans have been submitted to the provincial government for a projected development at Chute à Caron, 21 miles south of the Grand Discharge on the Saguenay River at the outlet of Lake St. John, and preliminary arrangements have been completed by the Duke interests to construct a dam which will increase the capacity of the Grand Discharge from 400,000 hp. to about 1,000,000 hp., making it the largest power development in Canada. Transmission wires will, it is said, be installed without delay from the development center, St. Joseph d'Alma, to Baie St. Paul and other points along the river. Provincial railways are to be offered an opportunity to use a portion of the power.

Preliminary Plans for Pacific Coast A. I. E. E. Convention Next Fall.—Under the general chairmanship of George E. Quinan, chief electrical engineer of the Puget Sound Power & Light Company, Seattle, plans are under way for holding the Pacific Coast convention of the American Institute of Electrical Engineers in Seattle on September 15 to 19. Headquarters for the convention will be at the new Olympic Hotel. Among the features which are planned for the entertainment of delegates will be a trip by special train to see the Baker River development under construction by Stone & Webster, Inc., for the Puget Sound Power & Light Company. If the details can be worked out, the convention party will be transported the same day to Monte Christo, a resort in the mountains near Seattle, to spend the night. A golf tournament will also be held.

Consolidated Gas & Electric Will Establish Broadcasting Station to Aid Baltimore.—In announcing the determination of the Consolidated Gas, Electric Light & Power Company to "put Baltimore on the radio map" by establishing a broadcasting station, President Herbert A. Wagner said that the company had decided to take this step as a civic duty and would derive no benefit from the enterprise which would not be shared by all dwellers in the city. "Baltimore should have, and is to have," Mr. Wagner said, "a superpower station conducted in a way to do credit to the city as a city-wide enterprise. While the cost of the proposed broadcasting station and its operation will be large, it is the purpose of the Gas & Electric company to finance it in such a way as to be negligible in its effect on valuations of the company's property and the establishment of rates for gas and electric service."

Statue to Surmount Alabama Power Company's New Office Building.—An innovation as regards the office buildings of electric light and power com-

panies has been determined upon by the Alabama Power Company for its new headquarters building in Birmingham. Instead of the great electric sign at first contemplated the company will place on the roof, at the apex formed by the intersection of the hip roof lines with the ridge and at the extreme front, a female figure of bronze approximately 16 ft. 6 in. high from toe to head, which is the work of Edward Field Sanford, Jr. Mr. Sanford has already completed models of three figures of Power, Light and Heat, which will be carved in the stonework of the frieze above the main entrance doorway of the building. He says that the statue on the roof will be symbolical of the State of Alabama. The figure, facing eastward, will be gracefully balanced on a pedestal and hold sheafs of lightning bolts in her hands. The bronze figure will be covered with gold-leaf, adding a touch of special brilliancy to the floodlighting that is contemplated.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, January 3, page 76.]

National Electrical Credit Association—Atlantic City, June 6-7; Philadelphia, June 8-9. F. P. Vose, Marquette Bldg., Chicago, Ill.

Associated Manufacturers of Electrical Supplies — The Homestead, Hot Springs, Va., June 8-12. F. Nicholas, 30 East 42d St., New York.

Northwest Electric Light and Power Association (Geographic Division N. E. L. A.)—Gasco Bldg., Portland, Ore., June 12. W. A. White, Puget Sound Power & Light Co., Portland.

Pacific Coast Electrical Association (Geographic Division N. E. L. A.)—San Francisco, June 15. S. H. Taylor, 529 Rialto Bldg., San Francisco.

National Electric Light Association—San Francisco, June 15-19. M. H. Aylesworth, 29 West 39th St., New York.

Society for the Promotion of Engineering Education — Union College, Schenectady, N. Y., June 17-20. F. L. Bishop, University of Pittsburgh, Pittsburgh.

National Council Lighting Fixture Manufacturers and National Association of Lighting Equipment Dealers—The Ambassador, Atlantic City, June 17-19. Herman Plaut, 432 E. 23d St., New York.

American Society for Testing Materials—Chalfonte-Haddon Hall Hotels, Atlantic City, N. J., June 22-26. C. L. Warwick, 1315 Spruce St., Philadelphia.

American Institute of Electrical Engineers—United States Hotel, Saratoga, N. Y., June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

Michigan Electric Light Association—Grand Hotel, Mackinac Island, June 25-27. Herbert Silvester, 401 South Main St., Ann Arbor, Mich.

Empire State Gas and Electric Association (Commercial Section)—Schenectady, June 25-26. C. H. B. Chapin, Grand Central Terminal, New York.

East Central Division, N. E. L. A.—Breakers Hotel, Cedar Point, Ohio, July 14-17. D. L. Gaskill, Greenville, Ohio.

North Central Division, N. E. L. A.—Duluth, Minn., July 15-17. H. E. Young, Minneapolis General Electric Co., Minneapolis.

International Association of Municipal Electricians—Hotel Statler, Detroit, Aug. 17-20. W. R. Arbuckle, Bayonne, N. J.

Men of the Industry

S. B. Irelan Heads Middle West Division

S. B. Irelan, who was elected president of the Middle West Geographic Division of the National Electric Light Association at its recent convention in

S. B. IRELAN

Omaha, as already announced in the ELECTRICAL WORLD, has been engaged in utility work with Henry L. Doherty & Company since graduation from Purdue University in 1909, his first employment being on the Denver property. Mr. Irelan has been general manager successively of the Bartlesville (Okla.) Gas & Electric Company, City Light & Traction Company, Sedalia, Mo., and Montgomery (Ala.) Light & Water Company, and is at the present time vice-president and general manager of the St. Joseph (Mo.) Railway, Light, Heat & Power Company. In 1922 Mr. Irelan was president of the Southeastern Division of the National Electric Light Association.

L. A. Coleman New Vice-President of New York & Queens Company

Lawrence A. Coleman, who was recently elected vice-president of the New York & Queens Electric Light & Power Company, as previously announced in

L. A. COLEMAN

the ELECTRICAL WORLD, was born in New York City in 1877. He entered the employ of the United Electric Light & Power Company in June, 1891, as office boy, holding various clerical positions until 1899, when he was appointed assistant in the office of the treasurer. He subsequently became cashier, retaining that position until 1905, when he became assistant secretary. In 1919 he was appointed treasurer of the company, and he held this office until his recent election to the vice-presidency of the New York & Queens Electric Light & Power Company. Mr. Coleman is a member of the board of directors of the United Electric Light & Power Company and is also secretary of the Brush Electric Illuminating Company of New York. He is actively associated with the affairs of the National Electric Light Association, having been chairman of the committee on commercial service and relations with customers for a few years and being at the present time a member of the insurance committee.

A. E. Waller New President of Power Club

Alfred E. Waller, whose election to the presidency of the Electric Power Club was announced in last week's issue of the ELECTRICAL WORLD, has been identified with the Ward Leonard Electric Company, Mount Vernon, N. Y., since 1909, when he entered its employ as assistant foreman in the testing department. In 1911 he was appointed assistant manager on administrative work, including sales, credits, production and design, and five years later was promoted to the position of production manager, supervising technical correspondence, general and detail design and raw material. After serving as assistant chief engineer he became chief engineer, and since 1918 has been in charge of design and production.

Mr. Waller has taken an active interest in the affairs of the American Institute of Electrical Engineers, the Franklin Institute of Pennsylvania and the Associated Manufacturers of Electrical Supplies and has contributed many papers to the proceedings of these and other technical associations.

Giuseppe Faccioli, engineer of the Pittsfield plant of the General Electric Company, sails June 6 on the SS. *Paris* for an extended European trip. From Havre he will motor to Paris, where he will attend the third international conference on high-voltage systems. After visiting various cities of France he will go to Berlin, and during July he will visit the principal cities of Germany, Austria and Czechoslovakia. Following a trip to Milan, Italy, where he will visit the General Electric plant in that city, he will visit relatives and friends in that country, his itinerary

including Florence, Assisi, Rome and other cities. He will return to the United States on the SS. *Conte Verde*, sailing from Naples August 21.

Charles A. Stone, chairman of the board of directors of Stone & Webster, Inc., returned from Europe May 27 aboard the White Star liner *Olympic* after a short sojourn abroad.

W. B. Flynn, formerly electrical engineer with the Day & Zimmermann Company, Philadelphia, recently became construction engineer in the electric department of the Georgia Railway & Power Company.

S. L. Muths, formerly assistant superintendent of the eastern division of the Alabama Power Company, Anniston, Ala., is now with the Mississippi Power Company at Gulfport.

Obituary

William J. Fraser, a pioneer transatlantic cable operator and for many years prior to 1917 district cable manager of the Western Union Telegraph Company at Boston, died in that city May 27 in his eightieth year. He was a native of Liverpool, England.

John W. Colby, superintendent of the Underwriters' Bureau of New England and for some time director of the regional branch of the Underwriters' Laboratories, Chicago, died suddenly May 27 at Medford, Mass. He was a graduate of the Massachusetts Institute of Technology, class of 1892, and at one time was employed by the General Electric Company and by Stone & Webster, Boston.

Harry B. Marshall, president of the Marshall Electric Company, St. Louis, and his wife were instantly killed May 26 in a grade-crossing accident four miles south of Owosso, Mich., when the automobile in which they were riding was demolished by a Michigan Central passenger train. Mr. and Mrs. Marshall were en route for Detroit. Mr. Marshall went to St. Louis from Chicago several years ago to establish the electric company, which manufactures the Marshallstat (a carbon-disk rheostat) and a constant-potential charger for battery service stations.

Sir William Fletcher Barrett, scientist and one of the founders of the Society for Psychical Research, died in London May 27 in his eighty-first year. Sir William began his scientific researches under the direction of John Tyndall, the famous physicist, when he was only nineteen years of age. In 1873 he was appointed professor of physics in the Royal College of Science, Dublin, and taught that subject there for thirty-seven years, resigning in 1910. His investigations and achievements were rewarded by the Universities of London, Edinburgh and Dublin with the degree of fellow of the Royal Society. He was a member of the Institution of Electrical Engineers and the Royal Irish Academy, a fellow of the Royal Society of Literature and a past-president as well as one of the founders of the Society for Psychical Research.

Recent Court Decisions

Principles for Determining Rate Base Again Enunciated.—The Supreme Court of New Jersey in affirming a decision in a rate case concerning the Millville Electric Light Company made by the Board of Public Utility Commissioners of New Jersey, and against which the company had appealed, stated the principles governing the formation of the rate base. These principles as laid down embrace the company's right to a fair income, based on fair valuation of property used for public service, paying due consideration to the cost of maintenance or depreciation and to current operating expenses, and the public's right to have no payment exacted from it greater than the company's services are reasonably worth, including a fair income to the stockholders on their investment. The company claimed that the board had erred in eliminating the value of a steam plant from the company's valuation and that the rates granted were unjust. The board maintained that the plant in question was no longer used since energy could be purchased more cheaply than the plant could make it, and that, since there would be a return of 8 per cent net on the value of the company's property as fixed by the board, the rates were just and reasonable. (128 At. 546.)*

Reasonable Inference of Causation Where Man Working with Electrically Operated Tools Meets Death.—The Supreme Court of Alabama sustained the finding under the workmen's compensation act (*ex parte* Todd Shipbuilding & Dry Docks Company) that a man in good health who fell to the ground while working with an electric drill, the drill being gripped in his hand, and soon died owed his death to an industrial accident arising in the course of his employment, even though no burns were found on his body. "The evidence," the court said, "shows a contact between a young and apparently vigorous man and an electrical appliance carrying a sufficient voltage, if short-circuited through his body, to cause his death. This contact, with its lethal potentiality and with its actual sequence of instant death, presents, we think, a rational suggestion of cause and effect—a reasonable inference of causation, and not merely a permissible hypothesis leading to a conjectural and therefore unwarranted conclusion. It is true that there is no evidence directly showing that the electrical appliance being used by the deceased was in such a condition as to permit the short-circuiting of the current; but the appliance was owned and operated by the defendant, and the circumstances of the workman's death at least imposed upon defendant the duty of showing that it was properly constructed and insulated and incapable of communicating a current of deadly force to the workman's body." (103 So. 447.)

Public Service Company not Bound to Inform Customer of Economical Way to Use Electricity.—The Supreme Court of New Hampshire, in reversing the decision of the lower courts in the case of Pantebakos vs. Rockingham County Light & Power Company, held that a public service company is not bound to instruct a customer fully in the most economical way to use electricity. Pantebakos had service wires connected to a hotel he was operating and upon being questioned by the company said that he intended to use the electricity for both lighting and heating. The company informed him that, although it would cost $40 extra, he would save money by installing another meter for heating if he was going to use much electricity for that purpose. He installed only one meter, however, and at the end of thirteen months brought this suit to recover the difference between what he paid and the amount he would have paid with two meters, contending that the company had not given him sufficient information and had not taken the pains to make him understand that should have been taken in view of the fact that he understood little English. (128 At. 534.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Transformer Charges and Demand Charges. — In approving charges for electric service imposed by the Dunkirk Electric Line the Wisconsin Railroad Commission said: "The higher charges for the larger transformers are justified because of larger losses, and further, in this particular case, because the utility is purchasing energy on a demand schedule. It is reasonable to assume, we believe, that the customers with the larger transformer installations will create relatively larger demands than those with the smaller installations, and for this reason a correspondingly higher demand charge should be reflected in the service charges of the larger users of energy."

Electrical End of Joint Utility Company Should Not Have to Carry Gas Division.—The Massachusetts Department of Public Utilities in increasing the gas rates of the Athol Gas & Electric Company, which has a good electric business but only a small gas business, said: "While it is true that the company as a whole has been able to earn a return upon its total investment, this has been done through its electric business. While perhaps this business might be considered as being obliged to carry to a certain extent the gas business, on the other hand the gas business should, if possible, be so conducted as to carry as nearly as may be its investment." The commission therefore imposed service charges for gas.

Manufacturing and Markets

Trade Association Activities Vindicated

Distribution of Statistics on Production and Other Matters Held Lawful by Supreme Court—Dissemination of Pertinent Information Tends to Stabilize Trade

TWO sweeping decisions clarifying the legal view of trade association activities in gathering and disseminating statistics on production, stocks, unfilled orders, specific job contracts and average sales prices were handed down by the United States Supreme Court on June 1. The court held that these things in themselves do not constitute restraint of trade. In previous cases, the court said, a clear intent to evade the law was established, but in the cases at issue the circumstances were different. The decisions specifically affected the Maple Flooring Manufacturers' Association and the Cement Manufacturers' Protective Association and set aside the findings of the lower courts by which both associations were deemed guilty of breaking the Sherman anti-trust law. The majority opinion was delivered by Justice Stone, the newest member of the court, who as Attorney-General had given considerable study to the question of trade statistics at the request of the Department of Commerce. Justice McReynolds entered a vigorous dissent in each of the two cases on the ground that the tendency of the activities complained of by the government clearly was to enrich the members of the associations by controlling production or prices or both to the detriment of the consumer. Chief Justice Taft and Justice Sanford dissented in each case on the ground that the evidence brought these cases within the rule laid down by the court previously in decisions sustaining decrees against the American Column & Lumber Company and the American Linseed Oil Company.

The principal decision was read in connection with the decree issued by the District Court in Michigan against the Maple Flooring Manufacturers' Association. The Cement Manufacturers' Protective Association operated along similar lines in gathering and distributing information. In addition, in the latter case the question of distributing information regarding specific job contracts was involved. Information regarding specific job contracts was held by the court as not in violation of the law because it had not been established that contractors suffered, but merely that the system protected manufacturers against contractors who might take advantage of such contracts for cement if the market was favorable. The broad principles set forth in the majority opinion on the flooring manufacturers' association case are as follows:

"It is not, we think, open to question that the dissemination of pertinent information concerning any trade or business tends to stabilize that trade or business and to produce uniformity of price and trade practice. Exchange of price quotations of market commodities tends to produce uniformity of prices in the markets of the world. Knowledge of the supplies of available merchandise tends to prevent overproduction and to avoid the economic disturbances produced by business crises resulting from overproduction. But the natural effect of the acquisition of wider and more scientific knowledge of business conditions on the minds of the individuals engaged in commerce and its consequent effect in stabilizing production and price can hardly be deemed a restraint of commerce, or, if so, it cannot, we think, be said to be an unreasonable restraint, or in any respect unlawful.

PUBLIC INTEREST SERVED

"It is the consensus of opinion of economists and of many of the most important agencies of government that the public interest is served by the gathering and dissemination, in the widest possible manner, of information with respect to the production and distribution, cost and prices of actual sales of market commodities because the making available of such information tends to stabilize trade and industry, to produce fairer price levels and to avoid the waste which inevitably attends the unintelligent conduct of economic enterprise. Free competition means a free and open market among both buyers and sellers for the sale and distribution of commodities. Competition does not become less free merely because the conduct of commercial operations becomes more intelligent through the free distribution of knowledge of all the essential factors entering into the commercial transaction. General knowledge that there is an accumulation of surplus of any market commodity would undoubtedly tend to diminish production, but the dissemination of that information cannot in itself be said to be restraint upon commerce in any legal sense. The manufacturer is free to produce, but prudence and business foresight based on that knowledge influence free choice in favor of more limited production. Restraint upon free competition begins when improper use is made of that information through any concerted action which operates to restrain the freedom of action of those who buy and sell.

"It was not the purpose or the intent of the Sherman anti-trust law to inhibit the intelligent conduct of business operations, nor do we conceive that its purpose was to suppress such influences as might affect the operations of interestate commerce through the application to them of the individual intelligence of those engaged in commerce, enlightened by accurate information as to the essential elements of the economics of a trade or business, however gathered or disseminated. Persons who united in gathering and disseminating information in trade journals and statistical reports on industry, who gather and publish statistics as to the amount of production of commodities in interstate commerce and who report market prices are not engaged in unlawful conspiracies in restraint of trade merely because the ultimate result of their efforts may be to stabilize prices or limit production through a better understanding of economic laws and a more general ability to conform to them, for the simple reason that the Sherman law neither repeals economic laws nor prohibits the gathering and dissemination of information. Sellers of any commodity who guide the daily conduct of their business on the basis of market reports would hardly be deemed to be conspirators engaged in restraint of interstate commerce. They would not be any the more so merely because shareholders in a corporation or joint owners of a trade journal engaged in the business of compiling and publishing such reports.

"We do not conceive that the members of trade associations become such conspirators merely because they gather and disseminate information, such as is here complained of, bearing on the business in which they are engaged and make use of it in the management and control of their individual businesses; nor do we think that the proper application of the principles of decision of Eastern States Retail Lumber Association vs. United States, or American Column & Lumber Company vs. United States, or United States vs. American Linseed Oil Company, leads to any such result. The court held that the defendants in those cases were engaged in conspiracies against interstate trade and commerce because it was found that the character of the information which had been gathered and the use which was made of it led irresistibly to the conclusion that they had resulted, or would necessarily result, in a concerted effort of the defendants to curtail production or raise prices of commodities shipped in interstate commerce. The unlawfulness of the combination arose not from the fact that the defendants had effected a combination to gather and disseminate information, but from the fact that the court inferred from the peculiar circum-

stances of each case that concerted action had resulted or would necessarily result in tending arbitrarily to lessen production or increase prices.

"Viewed in this light, can it be said in the present case that the character of the information gathered by the defendants, or the use which is being made of it, leads to any necessary inference that the defendants either have made or will make any different or other use of it than would normally be made if like statistics were published in a trade journal or were published by the Department of Commerce, to which all the gathered statistics are made available? The cost of production, prompt information as to the cost of transportation, are legitimate subjects of inquiry and knowledge in any industry. So likewise are the production of the commodity in that industry, the aggregate surplus stock and the prices at which the commodity has actually been sold in the usual course of business.

CONCERTED ACTION ILLEGAL

"We realize that such information gathered and disseminated among the members of a trade or business may be the basis of agreement or concerted action to lessen production arbitrarily or to raise prices beyond the levels of production and price which would prevail if no such agreement or concerted action ensued and those engaged in commerce were left free to base individual initiative on full information of the essential elements of their business. Such concerted action constitutes a restraint of commerce and is illegal and may be enjoined, as may any other combination or activity necessarily resulting in such concerted action as was the subject of consideration in American Column & Lumber Company vs. United States (supra) and United States vs. American Linseed Oil Company (supra). But in the absence of proof of such agreement or concerted action having been actually reached or actually attempted under the present plan of operation of defendants, we can find no basis in the gathering and dissemination of such information by them or in their activities under their present organization for the inference that such concerted action will necessarily result within the rule laid down in those cases.

"We decide only that trade associations or combinations of persons or corporations which openly and fairly gather and disseminate information as to the cost of their product, the volume of production, the actual price which the product has brought in past transactions, stocks of merchandise on hand, approximate cost of transportation from the principal point of shipment to the points of consumption, as did these defendants, and who, as they did, meet and discuss such information and statistics without, however, reaching or attempting to reach any agreement or any concerted action with respect to prices or production or restraining competition, do not thereby engage in unlawful restraint of commerce."

The new Attorney-General is understood to be following a liberal policy in connection with trade association activities. Trade associations in doubt as to the legality of their statistical or other plans are being encouraged to submit any question they may have to the department. If the proposed activity is objectionable, a statement to that effect probably will be forthcoming. However, there is not likely to be a formal approval of any activity.

Business Conditions

THE uncertainty of receiving orders is characteristic of the electrical industry at the present time. The conditions at many factories are quite similar. Several orders are being filled and business is considered good, but at any one time manufacturers are unable to see much forward business. Sales on some days are good, while on other days the business transacted is poor. The expansion plans of various central-station companies, coupled with the fact that despite a spotty condition total monthly sales are good and the knowledge that fundamental conditions are sound, all presage, however, that there will be no falling off in business. The iron and steel industry is said to be showing a steady improvement.

In New England there is an active demand for street-lighting equipment as well as an encouraging activity in house-wiring contracts. There is no striking demand for equipment and supplies in that section, but the volume of sales is good. Sales in the New York district are spotty but are considered satisfactory. One central-station company in that territory is an active purchaser, and the demand for building construction materials is very good. In the Southeast business is variable, with a slight improvement noted during the latter part of May. Florida and Alabama continue to be the origin of most orders. Purchasing and construction work by various utility companies is proceeding steadily and building actively continues in the Middle West, with the outlook toward stabilization of business. On the Pacific Coast sales have improved, and some good lighting material orders have been placed.

Metal Markets Quiet—Prices Hold Steady

SALES have been in somewhat smaller volume in the metal market this week, owing to the holiday on Saturday and the Whitsuntide holiday in London on Monday. Copper and lead show little variation in price, and zinc and tin are slightly lower owing to a decline abroad. The firm and steady copper market, with delivered prices varying from 13¼ cents to 13⅝ cents, has now continued for six weeks, much to the satisfaction of both sellers and buyers, though the former feel that the price is too low. Domestic sales have been small again during the last week, but the export business has taken all pressure off the market. Practically all producers are selling at 13⅝ cents delivered in the East and 13⅜ cents in the Middle West. An occasional small lot is sold at a slight concession. Most of the business has been for comparatively early delivery, an unusual number of large consumers taking small lots for June shipment.

NEW YORK METAL MARKET PRICES

	May 27, 1925 Cents per Pound	June 3, 1925 Cents per Pound
Copper, electrolytic	13⅜	13.60
Lead, Am. S. & R. price	8¼	8.40
Antimony	17	16½
Nickel, ingot	31	31
Zinc, spot	7.45	7.30-7.35
Tin, Straits	56	54⅜
Aluminum, 98 to 99 per cent	28	28

Base copper price June 3, 1925, 16 cents.

The contract price of the American Smelting & Refining Company for lead was advanced on May 28 to 8.40 cents.

Heavy tonnages of lead were sold during last week—Thursday and Friday and also on Monday. Since then the demand has eased considerably, although one producer has found no change. Declines in the London market, though not important, have weakened zinc prices. Domestic consumers have not been interested in the tin market lately. There has been some activity on the part of traders to depress the market.

Street-Lighting Equipment in Active Demand in New England

INTEREST in street lighting is quite active in New England. One manufacturer reports contracts for this district that exceed in amount those of all other districts of the country at large for the month of May with the single exception of the Chicago district. The town of Blandford has adopted street lighting service, and contracts amounting to over $300,000 for electric lighting are expected to be awarded soon. In Springfield a contract amounting to about $100,000 for a new substation has been let by the United Electric Company. There is an encouraging activity in house-wiring contracts, owing, in part, to an unprecedented building boom now under way in New England. The Boston Edison Company reports over 25 per cent increase in new applications for meters for the period to date as compared with a corresponding period in 1924, and of these over 25 per cent is charged up to new buildings. Industrial lighting is maintaining active interest. One manufacturer reports a good demand for underground conduit boxes and reflectors. Wire and insulation are selling well.

Motors continue to sell with an uneven trend, while, on the other hand, quite a few electrical industrial specialties are in brisk demand. Electric portable tools for contractors have a good market and small electrical com-

pressor units are quite active, particularly those suitable for garages and pressure sprayers for painting. Household electrical appliances are moving steadily, with electric ranges in fair demand. One manufacturer of these reports a shipment of two carloads to Texas during the past week. Sales of refrigerating units are also quite active. There is no striking demand for electrical equipment and supplies, but the volume of sales is good.

Sales Improve on Pacific Coast—Good Lighting Orders Placed

AN IMPROVEMENT has been noted in sales on the Pacific Coast. The usual monthly stock orders from dealers cover larger quantities of staple materials. Power-company purchasing has been rather light and consisted mainly of strain insulators, pike poles and other maintenance material, but with practically no pole-line hardware. The Southern California Edison Company is reported as requesting quotations on approximately 50,000 high-tension insulator units for 220,000-volt service, to cost about $120,000. Several carloads of 55-ft. poles are requested for the Sacramento Valley.

Recent lighting orders include one for 400 units amounting to $7,500 and another for 160 units for about $3,000. Vacuum cleaners and washing machines are selling well. Stocks are good with a tendency to expansion in special cases. For instance, larger buildings and increased industrial work in the territory have rendered necessary stocks of conduit larger than 4 in. and of conduit fittings larger than 3 in. The lumber industry, which has been unstable since the first of the year, has been buying only necessary replacement material. The outstanding sales record of the year has been that of electric ranges and water heaters for apartments and residences.

Construction by Utility Companies Active in the Middle West

THE immediate outlook for business in the Middle West appears to be toward stabilization, rather than to display a tendency to fall off, and, though not uniform, it is generally promising. Purchasing and construction work by the various utility companies is proceeding steadily and building activity continues. An interesting order for 115,000 lb. of busbar copper was placed by one utility company, and there has been a considerable demand for distribution transformers. Sales of pole-line hardware has been active, and many orders for high-tension fuses were received.

Jobbers' sales have been better. The volume of sales has not equaled that of previous weeks, but it is good. Throughout the Northwestern territory, particularly in Minneapolis, St. Paul and Duluth, business is exceptionally good, while in Omaha it is somewhat dull. Current complaints about trade are frequently exaggerated. Prices are firmer. List prices of certain types of carbon lamps were increased 10 per cent. Wire prices are stiffening, although concessions are being offered upon large contracts.

Sales Spotty in New York District—Construction Active

SALES in the New York district are spotty but are considered satisfactory. Since the first of the month little business has been placed, but prior to that sales were good. As expressed in several cases by different manufacturers, orders received on some days are good, then for a short period orders are few and poor with little indication as to where future business will accrue, but the total sales at the end of the month are good. One central-station company has been placing very good orders for all lines of equipment and supplies. Sales of pole-line equipment and hardware have been generally somewhat slower. The utilities merger in upper New York State has delayed the placing of a number of orders.

Wire sales are reported as good, with competition very keen on the smaller sizes, but prices on the larger sizes are firmer. The hot weather has been productive of an enormous demand for fans. One jobber estimates that he has sold more fans this week than in the latter half of last season. Sales of weatherproof sockets, plugs, conduit, portable-lamp cords and kindred material are in very good demand, and jobbers report business as being good.

Business Spotty in the Southeast—Slight Improvement Noticed

BUSINESS in the Southeast continues spotty. Central-station activities dominate with the heaviest construction programs under way in Florida and Alabama, and the orders are mostly for poles, wire and other line materials, distribution transformers and house-type meters. Reports generally indicate a slight improvement during the latter part of May, with most of the orders coming out of Florida and Alabama, where activities are unusually great. The demand for telephone equipment and supplies is very good.

In Georgia and the Carolinas small contracting business is rather quiet, with purchases at a low figure, and orders from dealers generally are not up to expectations. Industrial activities are spotty, some life being noted in the clay and brick industries, but textiles are not up to predictions made earlier in the year. In fact, curtailment on the part of some mills during the past week has served to dampen somewhat plans for expansions that have been already announced. This condition is only temporary, for the textile industry is in far better shape than for several years past. Storage-battery lines, particularly automotive starting types, are reasonably active, with quite a good volume of inquiries being received for industrial truck and mine locomotive batteries.

Activities of the Trade

Westinghouse Agent-Jobbers Elects Officers

The following officers and members of the executive committee and the nominating committee of the Westinghouse Agent-Jobbers' Association have been elected: B. F. Finucane, president; J. S. Tritle, vice-president; Karr Parker, secretary, and H. T. Pritchard, assistant secretary and treasurer. The executive committee elected is composed of J. C. Schmidtbauer, F. N. Averill, George Baily, T. J. Pace and Charles E. Stephens, all for two years, while John A. Duncan was elected for one year. The nominating committee elected consists of N. G. Harvey, Harry J. Gundlach, L. L. Hirsch, John J. Gibson and S. A. Chase.

Crocker-Wheeler Stockholders to Consider Change in Capital

A meeting of stockholders of the Crocker-Wheeler Company, Ampere, N. J., has been called for June 18 to vote on a number of changes proposed by the directors. It is proposed to change the name of the company to the Crocker-Wheeler Electrical Manufacturing Company and to revise the company's charter to make the life of the company perpetual instead of limiting it to December 31, 1941.

The proposals further include changing the status of the common stock from a $100 par to a no-par basis, and the issuance as required of the 19,482 shares authorized but not yet issued, issue to be made as needed and at a price to be fixed by the directors. Present stockholders would have the first option on the proposed stock issue. In the circular to the stockholders the directors state that existing bank loans should be reduced in the interest of the projected new financial and operating policy.

The directors also declare that the measures proposed will result in putting the company in a position to expand business and bring about the resumption of common dividends.

The Cassidy Company, 101 Park Avenue, New York, manufacturer of electric lighting fixtures, is arranging for the early erection of its proposed plant on the Queens Boulevard, Long Island City, reported to cost in excess of $75,000, with equipment.

The Pringle Electric Manufacturing Company, 1906-12 North Sixth Street, Philadelphia, manufacturer of panelboards, switchboards, etc., has completed plans for an addition to its plant which is expected to cost more than $50,000.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BLOCK ISLAND, R. I.—Plans are under way by the Island Light & Power Company, New Shoreham, recently incorporated, to install an electric plant on Block Island. William E. Sherwood, Providence, is manager.

PROVIDENCE, R. I.—The Narragansett Electric Lighting Company plans to build a switching station at its power plant on Eddy Street. Jenks & Ballou, Grosvenor Building, are architects and engineers.

BRIDGEPORT, CONN.—An electrical department and electric power equipment for shop service will be installed in the Trade School to be erected on Kossuth Street, at a cost of about $200,000, by the State Board of Education, Hartford. E. B. Caldwell, Jr., Bridgeport, is architect.

Middle Atlantic States

ALBANY, N. Y.—The Albany Port Commission plans to install electric power equipment at its proposed grain elevator, refrigerating and cold-storage plant, to cost about $750,000.

BUFFALO, N. Y.—Permission has been granted the Niagara, Lockport & Ontario Power Company to exercise electric franchises in Humphrey and Great Valley, recently granted to the Olean (N. Y.) Electric Light & Power Company, taken over by the Niagara company. Approval has also been given for the erection of a high-tension transmission line by the Niagara company across that part of the Allegany Indian Reservation in the towns of Great Valley and Carrolton, extending from a point near Seneca Junction to Salamanca.

COLD SPRING, N. Y.—The Cold Spring Light, Heat & Power Company has applied for permission to construct an electric system in Nelsonville and for approval of a franchise granted by the Village Board.

HUDSON FALLS, N. Y.—The Union Bag & Paper Corporation, Woolworth Building, New York, plans to increase the output of its local hydro-electric plant by about 45,000 hp. in connection with proposed state regulation of waters of the Hudson River in this section. The Adirondack Power & Light Company, Schenectady, it is reported, has contracted for the excess power.

KEESEVILLE, N. Y.—Permission has been granted the Northern Adirondack Power Company to take over the properties and franchises of Frank E. Everest in Wilmington and the Ausable Valley Light, Heat & Power Company, Keene. The Northern Adirondack company proposes to connect its lines with both plants and to make extensions to both systems.

NEW YORK, N. Y.—Officials of the International Paper Company, Pershing Square Building, have organized a subsidiary company, to be known as the International Hydro-Electric Corporation, to take over and operate the present power plants of the parent company, and to develop additional hydro-electric plants at various power sites now held, including Canadian power sites.

NIAGARA FALLS, N. Y.—Plans for the proposed mill of the Wicker Lumber Company, to be erected at 1516 Lockport Street, for which a general contract has been awarded, include a power plant.

OLEAN, N. Y.—Plans for rebuilding the local tannery of Armour & Company, Chicago, recently destroyed by fire, include a power house. The loss is estimated at about $500,000.

RANDOLPH, N. Y.—Fred W. Young has applied for permission to construct a local power plant, with substations and transmission lines to furnish service at Cold Spring, East Otto, Little Valley and Napoli.

WATERTOWN, N. Y.—The Northern New York Utilities, Inc., has petitioned the Public Service Commission for permission to erect a 110,000-volt steel-tower transmission line from its switching station at Taylorville, on the Beaver River, to its substation at Black River, a distance of about 27 miles, and to install necessary switching and lightning-arrester equipment at both stations. The cost is estimated at about $498,000. Authority is also asked to issue securities to pay for same.

CAMDEN, N. J.—Bids will be received by the Commissioner of Public Works until June 11 for the complete electrification of the municipal waterworks plant. The cost is estimated at $300,000.

BRISTOL, PA.—The Huff-Daland Company, Ogdensburg, N. Y., plans to build a power plant in connection with its proposed local factory.

ELKTON, MD.—Permission has been granted to the Northern Maryland Electric Company, Baltimore, to erect transmission lines on four different routes in Cecil and Harford Counties.

WOODBINE, MD.—Permission has been granted the Woodbine Light & Power Company to erect a transmission line from Parrsville along the Frederick Pike through Lisbon to the village of Woodbine. The company was also authorized to issue $12,000 in capital stock.

MIDDLEBURG, VA.—The Loudon Light & Power Company, Purcellville, plans to extend its transmission line here for local service and to build a substation.

ROANOKE, VA.—Preliminary plans are under consideration by the Roanoke-Staunton River Power Company for a hydro-electric development on the Roanoke River, near Goose Creek, with transmission lines, to cost about $450,000.

WASHINGTON, D. C.—Bids will be received by the General Purchasing Officer, Panama Canal, Washington, until June 19 for two transformers, 100 one-lamp fixtures, 5,000 ft. power cable, 10,000 ft. telephone cable, 25,000 ft. insulated wire, 100 storage batteries, one set storage batteries, 200 B batteries, 150 battery jars, 750 terminal tubes, etc. (Panama Circular 1675).

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, Washington, until June 9, for a quantity of telephone supplies, including 200 receivers, 100 transmitter attachments, 2,400 dielectrics, etc. (Proposal C. P. 20714-1); also, until June 25 for forty audio-frequency filters (Circular C. P. 21299-1).

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until June 9, for a quantity of telephone cable for various yards (Schedule 3839); also, until June 19, for a quantity of dry and flashlight batteries for various yards (Schedule 3856).

WASHINGTON, D. C.—Bids will be received by the Purchase and Issue Subdivision, United States Veterans' Bureau, Washington, until June 23, for motor-driven dishwashing machines as required during the six months ending Dec. 31, 1925 (Circular G-213).

WASHINGTON, D. C.—Bids will be received by the Board of District Commissioners, District Building, Washington, until June 11, for the installation of interior telephone system and extension to clock and bell systems in the public schools.

North Central States

DETROIT, MICH.—Plans are being considered by the Board of Education for a central power plant for school service, to cost about $567,000.

DETROIT, MICH.—Plans are being prepared by the Public Lighting Commission for the construction of two substations, to cost about $90,000. Smith, Hinchman & Grylls, Marquette Building, are architects.

ATHENS, OHIO.—The Arthur Chemical Company, 48 Miami Street, Columbus, plans to install electric power equipment at its proposed local plant, to cost about $250,000. J. A. Martin, Hotel Berry, Athens, is engineer.

CLEVELAND, OHIO.—Separate bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until June 12 for paper-insulated, lead-covered cable and for fiber conduit for the Division of Light and Power.

DAYTON, OHIO.—Bids will be received by the Engineering Division, Air Service, United States Army, McCook Field, Dayton, until June 10, for electrical equipment for the propeller-testing laboratory (Circular 75).

HARVEYSBURG, OHIO.—The Harveysburg Electric Company contemplates installing a 15-hp. oil engine and a 7½-kw. generator during 1925. W. P. McCarren is owner and manager.

NEW PHILADELPHIA, OHIO.—The construction of a new power plant, to cost from $50,000 to $60,000, is under consideration by the City Council.

SANDUSKY, OHIO.—The Ohio Public Service Company, Cleveland, has acquired a site on Perkins Avenue for a substation.

AUGUSTA, KY.—Extensions and improvements contemplated by the Kentucky Power Company during 1925 include the erection of a 10-mile, 138,000-volt transmission line to connect Mount Oliver with Augusta, the extension of a 66,000-volt transmission line to Dover and probably the installation of a new Diesel-engine-driven unit. Joe R. Matthews is superintendent.

LEXINGTON, KY.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 26 for remodeling a parcel post lift at the United States post office, Lexington. For details see Searchlight Section.

LOUISVILLE, KY.—Plans are being considered by the City Commissioners for extension of the electric lighting system to the recently annexed residential subdivisions of Ashland Park and Hollywood.

MURRAY, KY.—The purchase of a 200-hp. Diesel-engine-driven generator unit with accessories for the municipal electric plant is under consideration.

EVANSVILLE, IND.—The Holt & Brandon Ice & Cold Storage Company, 820 Walnut Street, plans to install electric power equipment in its proposed ice and cold-storage plant, to cost about $180,000. George B. Bright Company, 2615 Twelfth Street, Detroit, is engineer.

LAFAYETTE, IND.—Preparations are being made for the construction of a new high-tension laboratory for the electrical engineering building at Purdue University. Nicol, Scholer & Hoffman, Lafayette, are architects.

MICHIGAN CITY, IND.—Plans have been prepared by the Northern Indiana Gas & Electric Company for the erection of an office building, to cost about $50,000.

CHICAGO, ILL.—Plans have been worked out for extensions to the street-lighting system, involving an expenditure of about $2,000,000, by the Department of Gas and Electricity. The plans provide for the reinforcement and rehabilitation of the present lighting system throughout the city. The largest item is the installation of 8,000 new street lamps in the fifteen outlying wards from the Evanston city limits to the Indiana boundary, at a cost of about $1,000,000, for which bids will be received in the near future. The construction of a new substation district, in addition to the existing twelve districts, will cost about $125,000, and the necessary conduits and transmission cable lines to connect the new district with the present system will cost an additional $50,000. Adding 1,000 lamps to the existing lighting system will cost about $100,000; for installation of new lamps in three widened thoroughfares $50,000 is provided; for the rehabilitation of the existing 100-cp. lamps in the residential district $75,000 has been provided.

MINNEAPOLIS, MINN.—Plans have been filed by the Intersectional Realty Company, 816 Second Avenue, for the construction of a steam-driven electric power plant at Seventh Street and Second Avenue, to cost about $100,000. Larson & McLaren, 816 Second Avenue, are architects.

GILMORE CITY, IOWA.—The Gilmore Light & Power Company is considering installing three-phase circuit for motor use only and other minor improvements. W. H. Heath is manager.

TRIPOLI, IOWA.—The electric plant of the Tripoli Canning Company has been acquired by the Northeastern Paper Company, Clermont. Extensions are contemplated by the new owners.

BOURBON, MO.—The Bourbon Electric Company contemplates changing its system from direct to alternating current and installing a 20-kva. generator and 30-hp. engine. As yet nothing definite has been decided. C. F. Bryant is proprieter.

HANNIBAL, MO.—The installation of a new turbo-generator set with accessories, to cost about $67,000, in the municipal electric light plant is under consideration by the Board of Public Improvements.

HURON, S. D.—The proposal to grant the Northwestern Public Service Company, Huron, a franchise to erect a high-tension transmission line along the highway on the south boundary of Tyndall will be submitted to the voters at a special election.

BEATRICE, NEB.—The Council is considering calling a special election to vote on the proposal to issue $120,000 in bonds for the erection of a transmission line for local commercial service.

Southern States

ASHEVILLE, N. C.—The City Council has contracted with the Asheville Power & Light Company for the installation of an improved lighting system, to cost about $27,000.

WILMINGTON, N. C.—An expenditure of $91,000 has been authorized by the Tidewater Power Company for the erection of the final link of the transmission line between Wilmington and Wananish, a distance of about 50 miles. Orders have been placed for material.

RIDGE SPRING, S. C.—The Board River Power Company, Columbia, plans to extend its transmission system here and to install a local distribution system.

SAVANNAH, GA.—The Savannah Electric & Power Company contemplates extensions to the boiler house at Riverside station, to cost about $150,000.

ST. CLOUD, FLA.—Bonds to the amount of $500,000 have been voted for public improvements, of which $50,000 will be used for extensions and improvements to the municipal electric lighting system.

SARASOTA, FLA.—Bids will be received by the City Council until June 15 for furnishing and erecting on foundations furnished by the city two 750-kw., 2,300-volt, 60-cycle, three-phase alternators, including two belt-driven exciters connected to two full Diesel engines and two generators complete and erected for synchronizing with other units in the plant. J. R. Crumby, Jr., is commissioner of public works.

TALLAHASSEE, FLA. — The construction of dam across the Oclochne River and power house, near here, to cost about $750,000, is under consideration by the West Florida Power Company. G. A. Winthrop is resident engineer. Mees & Mees, Kinney Building, Charlotte, N. C., are consulting engineers.

WAUCHULA, FLA. — Plans are under way for improvements to the municipal electric plant to install an ornamental lighting system.

BIRMINGHAM, ALA. — The Alabama Power Company contemplates the erection of a double-circuit transmission line from the Warrier steam plant to Fulton Springs, a distance of about 26 miles; also an 11,000-volt line from Calera to Columbiana, 10 miles long. Haleyville will be served by a 110,000-volt primary substation, tapping the Warrior-Sheffield transmission line. It is also proposed to erect a transmission line from this substation to Brilliant, a distance of 18 miles. All work will be done by the company's forces.

RUSSELLVILLE, ARK.—The Arkansas Light & Power Company, Pine Bluff, plans to rebuild its local power plant, recently damaged by fire.

HOUSTON, TEX.—The Houston Lighting & Power Company plans extensions in its substation in the South End district.

Pacific and Mountain States

TACOMA, WASH.—Plans are being prepared by the City Light Department for the erection of an auxiliary substation at Twenty-first and Adams Streets, to cost about $10,000.

BAKERSFIELD, CAL.—The installation of an electrolier lighting system in the business and residential sections, to cost from $50,000 to $60,000, is under consideration. W. D. Clarke is city engineer.

FRESNO, CAL.—Plans for the proposed local branch plant of the Tower Cotton Mills Company, Niles, Mich., to cost about $750,000, include a power plant.

LONG BEACH, CAL. — The Southern California Edison Company plans to install three power cables and one telephone cable (submarine) across the turning basin, in Long Beach harbor.

LOS ANGELES, CAL.—The City Council has adopted ordinances providing for the installation of ornamental lighting systems on portions of Crenshaw Boulevard and Western Avenue, using concrete standards.

SAN ANDREAS, CAL.—Plans for the proposed local cement mill of the Calaveras Cement Company, California Commercial Building, San Francisco, to cost about $1,500,000, include a power plant.

SAN DIEGO, CAL.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until June 9, for one transformer for the local navy yard (Schedule 3843).

SAN FERNANDO, CAL.—Bids will be received by the Board of County Supervisors, Hall of Records, Los Angeles, until June 15 for electric work, fixtures, etc. for the recreation building at Retiro, near San Fernando.

WATSONVILLE, CAL. — The Board of City Trustees is considering the installation of an ornamental street-lighting system on West Lake Avenue. H. B. Kitchen is city engineer.

ROSWELL, N. M.—The Consolidated Light & Power Company, Roswell, which has recently purchased the electric plants at Carlsbad, Artesia, Hagerman and Roswell, contemplates an expenditure of about $250,000 during the next six months for extensions and improvements, including the installation of additional equipment and the erection of a 45-mile high-tension line now under way between Roswell and Artesia. The installation of an additional 3,500-hp. turbine in Roswell by January next is contemplated. New engines are being installed at the Artesia plant and a transmission line will be built from the Carlsbad plant to Loving, a distance of 12 miles. Many of the smaller towns in the Pecos River Valley will be provided with a twenty-four-hour service. An extension of the transmission system to a number of towns in the plains region above the "Cap Rock" is planned for the future.

Canada

PRINCE RUPERT, B. C. — Plans are under consideration to double the capacity of the municipal hydro-electric system, at a cost of about $500,000.

SAPPERTON, B. C.—Electric power equipment will be installed in the proposed local refrigerating and cold-storage plant to be constructed by Frye & Company, Ninth Street South and Walker Avenue, Seattle, Wash., to cost about $200,000.

KENORA, ONT.—Plans are being prepared by the Backus-Brooks Company, Builders' Exchange, Minneapolis, Minn., for the erection of a hydro-electric plant, with initial capacity of 17,000 hp., to be used for a proposed local sulphite paper mill. The cost of the entire project is estimated at $7,500,000. J. T. McClellan, Kenora, is engineer in charge.

Electrical Patents

Announced by U. S. Patent Office

(Issued May 5, 1925)

1,536,469. COMBINED SWITCH AND FUSE BOX; R. H. Bennett, Washington, D. C. App. filed July 26, 1921.

1,536,482. TELEPHONE RECEIVER; F. Dietrich, Flushing, N. Y., and E. Bergman, New York, N. Y. App. filed June 13, 1922.

1,536,486. TELEPHONE DIAPHRAGM; H. Fischer, New York, N. Y. App. filed Oct. 24, 1922.

1,536,488. TROLLEY; E. F. Lewis Fritz, Chicago, Ill. App. filed Feb. 28, 1924. For overhead feed wires for electric traction.

1,536,522. EXTENSION PLUG FOR ELECTRIC SOCKETS; L. P. Pellegren, Torrington, Conn. App. filed Oct. 17, 1922.

1,536,538. ELECTRIC GRILL; V. B. Stougger, Detroit, Mich. App. filed Dec. 8, 1924.

1,536,541. PROCESS AND APPARATUS FOR MAGNETIC SEPARATION; G. Ullrich, Magdeburg, Germany. App. filed May 1, 1923.

1,536,543. STRAND DETECTOR AND DETAINER; W. P. Williamson, Ludlow, Mass. App. filed March 3, 1924. For use with filament-handling machinery.

1,536,569. IMPREGNATION OF FIBERS BY ELECTROLYSIS; H. Cruse, Hyde, England. App. filed Aug. 15, 1924.

1,536,584. MAGNETO POST; D. C. Husted, Marshall, Okla. App. filed April 11, 1922.

1,536,612. METHOD OF PRODUCING CARBON BLACK; W. K. Lewis, Newton, Mass. App. filed Feb. 15, 1923.

1,536,628. SPARK-GAP MECHANISM; C. J. Reed, San Mateo, Cal. App. filed Feb. 28, 1921.

1,536,669. HEATED COMB; C. Grant, St. Louis, Mo. App. filed March 6, 1923.

1,536,688. ELECTRIC FLATIRON CONNECTION; Ivyal R. Osborn, River Falls, Wis. App. filed March 29, 1924.

1,536,712. TELEPHONE-RECEIVER ATTACHMENT; F. K. Hehnly, Madera, Pa. App. filed March 3, 1924.

1,536,748. WIRING SYSTEM; E. E. Ashley, Jr., Noroton, Conn. App. filed Jan. 14, 1924. Concealed wiring disposed in conduits.

1,536,749. INSULATOR; A. O. Austin, Barberton, Ohio. App. filed Dec. 3, 1919.

1,536,753. TELEGRAPH SYSTEM; J. H. Bell, South Orange, N. J. App. filed April 17, 1922.

1,536,759. OVERHEAD-TROLLEY SYSTEM; G. W. Bower, Schenectady, N. Y. App. filed May 18, 1923.

1,536,761. STATIONARY INDUCTION APPARATUS; F. F. Brand, Pittsfield, Mass. App. filed March 14, 1919.

1,536,763. TESTING SYSTEM; J. T. Brown, New York, N. Y. App. filed Sept. 28, 1922. Microphone transmitters.

1,536,764. SIGNALING SYSTEM; O. E. Buckley, Maplewood, N. J. App. filed Dec. 27, 1919. Submarine cable-telegraph system.

1,536,769. ROTARY SNAP SWITCH; H. Catlin, Fairfield, Conn. App. filed June 16, 1921.

1,536,772. ELECTRIC SWITCH; C. Christensen, Chicago, Ill. App. filed Aug. 30, 1920. Having contacts separable in an insulating fluid.

1,536,774. AUTOMATIC ARC WELDING; W. B. Clarkson, Schenectady, N. Y. App. filed July 21, 1924.

1,536,784. ELECTROMAGNETIC DEVICE; J. R. Fry, New York, N. Y. App. filed March 24, 1921.

1,536,804. BURGLARY-PROTECTION MEANS; F. C. Mason, Los Angeles, Cal. App. filed Feb. 9, 1920.

1,536,809. SIGNALING SYSTEM; L. M. Potts, Highwood, N. J. App. filed Sept. 7, 1922. Control apparatus.

1,536,830. SYSTEM AND SWITCH FOR CONTROLLING ELECTRIC TRANSLATING DEVICE; J. Eaton, Schnectady, N. Y. App. filed Sept. 6, 1922.

1,536,838. SPOT-WELDING MACHINE; H. Geisenhoner, Schenectady, N. Y. App. filed Oct. 20, 1923.

1,536,841. TROLLEY AND SIGNAL WIRE-HANGER; A. J. Gurney, Canton, Ohio. App. filed Nov. 7, 1923.

1,536,844. LIGHTING UNIT; W. Harrison and J. H. Waterbury, Cleveland, Ohio. App. filed Sept. 6, 1922.

1,536,845. VOLTAGE-REGULATING MEANS FOR DIRECT-CURRENT GENERATORS; J. Y. Hartman, New Orleans, La., and R. L. Fuller, Arabi, La. App. filed Sept. 19, 1923.

1,536,852. ELECTRIC SWITCH; J. D. Hilliard, Schenectady, N. Y. App. filed Jan. 2, 1923. Series-break type.

1,536,855. ELECTRON-DISCHARGE DEVICE; W. G. Houskeeper, New York, N. Y. App. filed July 20, 1920. Electrode-supporting structure and arrangement of lead wires.

1,536,907. CARRIER-CURRENT SYSTEM; J. Mills, Wyoming, N. J. App. filed Feb. 27, 1920. Prevents echoes due to unbalancing of carrier-current system.

1,536,926. ELECTRIC HEATING UNIT; E. Probst, Charlottenburg, Germany. App. filed March 22, 1923.

1,536,932. KEYED INSULATING BOARD; C. A. Rolfe, St. Paul, Minn. App. filed Aug. 17, 1921.

1,536,933. BURGLAR AND FIRE-ALARM APPARATUS; R. H. Rose, Detroit, Mich. App. filed July 25, 1921.

1,536,934. BURGLAR AND FIRE-ALARM SIGNAL FOR TELEPHONES; R. H. Rose, Detroit, Mich. App. filed Aug. 25, 1921.

1,536,953. SWITCH; Marion C. Waters, Brookfield, Mo. App. filed April 22, 1921. For motor-vehicle transmissions.

1,536,979. PANELBOARD INSTALLATION; W. A. Stacey, Chicago, Ill. App. filed May 25, 1922. Dead-front panel.

1,536,996. AUTOMATIC STEERING SYSTEM FOR SHIPS; O. E. Winter, Stockholm, Sweden. App. filed July 7, 1922. For automatically stabilizing the ship on a change of course.

1,536,999. CONTROLLING SWITCH; F. Z. Barrundia, Guanajuato, Mexico. App. filed April 25, 1924. For use with moving electric display or advertising signs.

Financial and Corporate

Utility Shares Advance

Leaders March Into New High Ground as Market Boom Continues to Be Felt

NOTWITHSTANDING profit taking in the big market, prices remain generally strong, and in the week under review public utility shares continued to lead in the forward movement. No stock on the New York Stock Exchange has, for example, had a more spectacular advance in the last year than American Water Works & Electric Company's common stock. The old stock of this company could have been bought last year as low as $40 a share. Stock that sold on that basis subsequently was split five to one, and the new stock on Monday of this week established a record high at $67 per share. In other words, American Water Works & Electric Company's stock has risen from the equivalent of $40 to $335 per share within something like a year.

Occurrences such as this naturally have drawn the attention of investors more and more to the utility shares, not to mention the speculators, and in the past week many issues were forced into new high territory. National Power & Light rose to something like $350 per share on persistent rumors of a split-up in the shares. The amount of available stock is limited, of course, so that a relatively small turnover will drive the stock considerably higher or lower as the case may be. National added about forty points to its position during the week. Lehigh Power Securities, about which rumors also are flying fast and thick, added twenty-nine points to its position of the week before and got into new high ground around 160. Southeastern Power & Light is another stock of which a relatively small amount is outstanding and which therefore is sensitive to market influences. United Gas & Electric improved to the extent of more than six points in the week, as did such stocks as Adirondack Power & Light, Electric Investors, Southern California Edison and others. Virginia Railway & Power crossed 120.

New Capital Issues

During the first week of June the electric light and power companies of the country floated new loans totaling $29,250,000. The Consolidated Gas, Electric Light & Power Company of Baltimore contributed $10,000,000 to this amount by two issues—one in the form of 6 per cent cumulative preferred stock priced at $100.50, totaling $1,000,000, and the other in the form of first refunding mortgage 5 per cent sinking fund gold bonds priced at 100½ and accrued interest, totaling $9,000,000.

The Detroit Edison Company was represented with an eight-million-dollar offering of general and refunding mortgage gold bonds, series B, the price being 99½ and interest, yielding over 5 per cent. Another sizable issue was offered by the Great Western Power Company of California—first and refunding mortgage sinking-fund gold bonds to the amount of $6,300,000. The proceeds from the sale of these bonds, priced at 99 and interest to yield about 5.57 per cent, together with funds on hand, will be used to retire on August 1 all first and refunding mortgage series B 7 per cent bonds of the company.

With the purpose of extending and perfecting the physical equipment of the company, particularly at the strategic points in the territory served, the Interstate Power Company made a new offering of 30,000 shares of 7 per cent preferred stock at a price of $95 per share and accrued dividends. On the completion of this new financing the company will have a total of 40,000 shares of 7 per cent preferred stock outstanding.

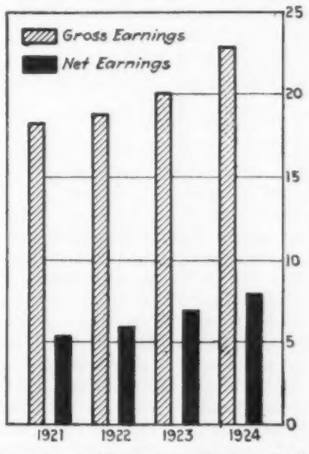
The Kansas Power & Light Company made an offering of first mortgage gold bonds, series A, totaling $2,100,000, the price being 100 and accrued interest, to yield 6 per cent.

National Power & Light's First Report

Old American Cities Company Properties Have, Under Electric Bond & Share Policies, Been Turned Into a Modern System—How Stocks Have Risen

BY PAUL WILLARD GARRETT

THE National Power & Light Company, which has just issued its first annual report in pamphlet form, is one of the newer large public utility companies. It did not begin business until January 1, 1922, having at that time acquired securities of companies formerly controlled by the old American Cities Company. The latter company had been in financial difficulties. Holders of its collateral trust bonds went to the Electric Bond & Share Company as a financial doctor to straighten out matters and to formulate a plan of reorganization that would best protect all holders of the securities.



EARNINGS OF NATIONAL POWER & LIGHT HAVE INCREASED STEADILY SINCE ITS ORGANIZATION

The Electric Bond & Share Company, which until then had had no connection with the American Cities Company group, worked out a plan of reorganization, after its usual period of investigation, whereupon the National Power & Light Company was organized. The new company, National Power & Light, acquired securities of companies operating in Knoxville, Memphis, Little Rock, Birmingham and Houston and in the suburbs of these cities. While it did not take over New Orleans, which had been in the American Cities group, it purchased the gas property in Memphis, which was not in the group.

The first thing that the management did, following out the usual Electric Bond & Share policies, was to put each individual operating company in strong position to finance in sound manner its future growth. By plowing surplus earnings back into the plant the physical properties gradually were rebuilt and thoroughly modernized. Improved service at the lowest rates possible helped in the development of the territory, thus strengthening, of course, the position of all securities on the National Power & Light list. Space does not permit an enumeration of specific achievements, but mention should be made of the completion last year of the Deepwater steam-electric generating station of the Houston Lighting & Power Company. This station, which is one of the largest and most up-to-date plants in the whole South and which has an initial installed generating capacity of 40,000 kw., is now in service.

Assets of National Power & Light Company, mostly in the form of investments, total $25,589,505. Holding company 7 per cent income bonds are outstanding to the amount of $8,503,100, and capital stock (no par value) is carried on the books at $13,046,779. The latter is represented by 38,909 shares of preferred and 122,078 of com-

mon. Following the statement of the parent organization, National Power & Light, appear statements for each of the leading subsidiaries—that is, Arkansas Central Power Company, Birmingham Electric Company, Houston Lighting & Power Company, Jackson Railway & Light Company, Knoxville Power & Light Company, Memphis Power & Light Company and the Memphis Street Railway.

Gross earnings of National's subsidiaries for last year were $22,886,444, or 9¼ per cent over those for the year before, whereas net earnings totaled $8,063,330, or 15 per cent over the previous year. After deduction of all interest charges and preferred dividends of the subsidiaries and the appropriation of a substantial sum for renewals and replacements, the balance applicable to the holding company was $2,841,530. Deductions of interest on National Power & Light's 7 per cent bonds and dividends of $7 per share on the preferred stock left $1,975,957, or $16.19 per share, for the common stock.

The spectacular rise in the market price of National Power & Light common to about $350 per share last week, as compared with a 1925 low of $185, reflects in part, of course, the increased earning power which seems to lie just ahead as a result of the patient development of the properties in past years. It very clearly reflects something else as well, however. No official announcement has been made of any such intention, but it must be pretty clear that the present National Power & Light shares will one of these days be split into smaller units. Doubtless it is in anticipation of such a step that the market for the stock has moved so swiftly forward of late.

Alabama Power Takes Over New Properties

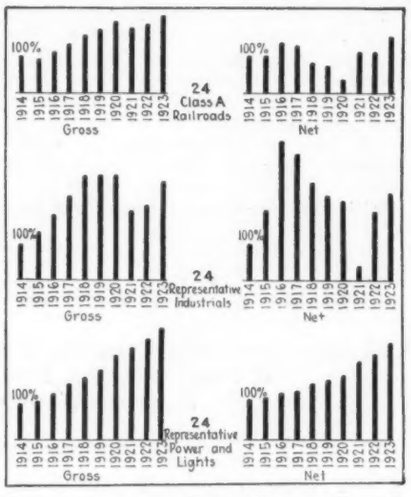
A merger agreement whereby the Alabama Power Company becomes a hundred-million-dollar corporation through the merging into it of two other companies has already been approved by the Public Service Commission.

Under the agreement the Birmingham, Montgomery & Gulf Power Company and the Sheffield Company are merged with the Alabama Power Company. The Birmingham, Montgomery & Gulf Power Company owns rights on the Tallapoosa River, while the Sheffield Company recently sold its utility properties serving Sheffield, Florence and Tuscumbia to the Alabama Power Company and Consumer Water Company.

The combined capital stock of the companies before the merger amounted to $81,100,000. The merger agreement provides that the consolidated company, which retains the name of the Alabama Power Company, shall have one million shares of stock. Most of this is no-par-value stock, but the value was estimated at $10 per share, or $100,000,000. The present officers and directors of the Alabama Power Company remain as officers and directors of the consolidated company.

"Power and Light" Utilities Show Stable Earnings

Striking contrasts in the stability of gross and net earnings of electric power and lighting companies as compared with railroads and industrials during the past decade are shown in the accompanying chart covering twenty-four companies of each class. The chart was prepared by Gillet & Company, investment bankers of Baltimore, Md., and records a clear gain in gross and net for these electric utilities each year



ELECTRIC UTILITIES SHOW MARKED GAIN IN GROSS AND NET EARNINGS

in the period. The rate of increase dropped off somewhat during depressed times, but at no time was there an actual slump in electrical earnings. A remarkable feature of the chart is the extraordinary growth of the electric companies since the close of the war. An upward trend is still indicated, showing a rapidly growing volume of business and increased economy of operation.

New Up-State Holding Company Organized in New York

The Mohawk & Hudson Power Corporation, chartered last week by the Secretary of State at Albany, N. Y., is to constitute the holding company through which the Adirondack Power & Light Corporation, the Municipal Gas Company of Albany, the Power Corporation of New York (embracing various western state power companies and the Northern New York Utilities, Inc.), the United Gas Improvement Company and the Adirondack Power & Light stockholders will be embraced in one corporation. The various certificates of incorporation filed through J. P. Zoller of Schenectady represent, it is said, a substitute plan, to be available in case the program outlined by the Mohawk & Hudson Power Corporation does not receive approval of the Public Service Commission or strikes a snag in the courts.

Seventy-five thousand shares of Municipal Gas Company stock of Albany, 40,000 shares of the Utica Gas & Electric Company, 25,000 shares of Cohoes Light & Power Company, 187,000 shares of Adirondack Power & Light Corporation, 73,439 shares of Northern New York Utilities, Inc., and 5,750 shares of Fulton Gas & Electric Company are among the stock to be taken over, it is stated.

The common stock of the new corporation will be apportioned as follows: Adirondack Power & Light Corporation interests, 35 per cent; Brady interests, 7 per cent; Power Corporation of New York, 15 per cent; United Gas Improvement Company, 15 per cent; Adirondack Power & Light stockholders, 28 per cent, the latter through rights to subscribe. If the Adirondack Power & Light subscribers do not take up the 28 per cent, the remainder will be offered to the public, it is stated.

Commission Approves Power Merger in Maryland

The Public Service Commission of Maryland granted permission to the Southern Pennsylvania Power Company to acquire 20,000 shares of common stock and $800,000 principal amount of bonds of the Northern Maryland Power Company. For this purpose the Southern Pennsylvania Company recently offered its first mortgage and collateral trust 6 per cent bonds, series A, to the amount of $1,200,000.

The Southern Pennsylvania Power Company supplies electric light and power in Oxford, Russellville, Cochranville and Nottingham, Pa. The Northern Maryland Power Company supplies the cities and towns of Rising Sun, Port Deposit, Elkton, Chesapeake City, Northeast, Perryville, Havre de Grace, Aberdeen and others in Maryland with electric light and power. These companies own and operate more than 65 miles of main transmission lines, of which about 30 miles are being reconstructed to provide additional capacity.

Dividends Declared

The following quarterly dividends have been announced by electric light and power companies and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
Associated Gas & Elec., class A	62½c.*	Aug. 1
Associated Gas & Elec., class A	62½c.*	Nov. 1
Associated Gas & Elec., pf.	87½c.	July 1
Detroit Edison	2	July 15
General Gas & Elec., pf. A	$2	July 1
General Gas & Elec., pf. B	$1.75	July 1
Kansas City Pwr. & Lt., pf. A	$1.75	July 15
Mississippi River Pwr., pf.	1¾	July 1
Montana Power, com.	1	July 1
Montana Power, pf.	1¾	July 1
National Power & Light, pf.	$1.75	July 1
North American, com.	2½†	July 1
North American, 6% pf.	1½	July 1
Ohio River Edison, 6.6% pf.	$1.65	Sept. 1
Ohio River Edison, 6% pf.	1½	Sept. 1
Ohio River Edison, 7% pf.	1¾	Sept. 1
Ohio River Edison, 6.6% pf.‡	55c.	July 1
Ohio River Edison, 6.6% pf.‡	55c.	Aug. 1
Ohio River Edison, 6.6% pf.‡	55c.	Sept. 1
Penn Central Lt. & Pwr., pf.	$1	July 1
Penn Central Lt. & Pwr. pf., extra	10c.	July 1
Pennsylvania Water & Power	2	July 1
Public Service Corp. of N. J. com.	$1.25	June 30
Public Service Corp. of N. J., 8% pf.	2	June 30
Public Service Corp. of N. J., 7% pf.	1¾	June 30
Public Service Gas & Elec., 6% pf.	1½	June 30
Worthington Pump & Mach., pf. A	1¾	July 1
Worthington Pump & Mach., pf. B	1¾	July 1

*Or one-fortieth share class A stock.
† Or one-fortieth share common.
‡ Monthly.

Utility Securities and Trust Funds

Life Insurance Companies and Savings Banks Are More and More Turning to the Issues of Public Service Companies to Find a Safe Investment for the Funds in Their Keeping

By Frank W. Smith

Vice-President and General Manager the United Electric Light & Power Company

EACH year trust funds to the extent of many millions of dollars are accumulated, and in order best to carry out the purposes of their accumulation the funds must be so invested that when needed for the purposes of their several trusts they shall be available as fully and as promptly as possible.

Among the principal sources of such trust funds seeking investment are life insurance companies and savings banks. The growth of deposits in savings banks in this country is due to conscientious and intentional efforts on the part of the depositors, it being apparent that there is an ever-increasing habit of thrift on the part of the public. However, the growth of funds in the hands of life insurance companies results almost automatically from the operation of the principles underlying the rules determining the nearly uniform annual premiums of so-called ordinary life policies.

One of the principal efforts of the legal reserve life insurance companies for many years has been to find safe investments for the millions of dollars constantly accumulating in their hands. The total investments of such companies in the United States have grown from $27,000,000 in 1860 to upward of $9,454,000,000 at December 31, 1923. The increase in the three years from 1920 to 1923 was more than $2,134,000,000, virtually three-tenths of the total increase during the preceding sixty years.

In the early years the investments were largely in mortgage loans, that class including more than 59 per cent in 1860, but as the years have passed this class has decreased in relative importance until in the decade between 1890 and 1900 it fell to second place, being surpassed by bonds and stocks of corporations, which class has since held first place in magnitude.

For many years railway bonds and stocks were the ones most preferred for investment by life insurance companies. A class of corporate securities now rapidly growing in esteem consists of the bonds, and to some extent the stocks, of public utility companies, such as gas, electric light and power, telephone and telegraph, etc. In many publications showing the investment of trust funds, this class of investment is included under the caption "Other Bonds and Stocks," but we are rapidly reaching the point where a more specific title will have to be provided. In a recent compilation of a considerable proportion of the holdings of life insurance companies in this country it was ascertained that while there are many conspicuous examples of very limited investment on the part of life insurance companies in public utility securities of the class referred to, one of the large Western life insurance companies had invested more than 17 per cent of its gross assets in securities of electric, gas, telephone and telegraph companies, while another had invested in such securities more than 13 per cent of its gross assets. The corresponding figure for a large New England company was more than 10 per cent. The New England Mutual Life Insurance Company had invested more than $13,000,000 in such securities, the Equitable Life Assurance Society more than $15,000,000, New York Life Insurance Company more than $26,000,000, the Prudential Insurance Company of America more than $35,000,000, and the great Metropolitan Life Insurance Company, under the wise guidance of Haley Fiske, more than $54,000,000. It is encouraging to note the increasing interest on the part of life insurance companies in the securities of our utilities.

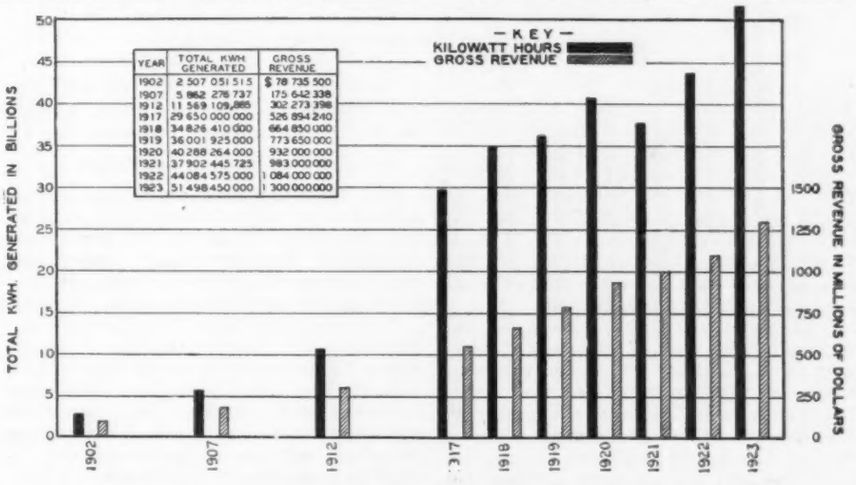
It is the purpose of this article to point out the desirability of further increasing the investment of life insurance company funds in securities of public utilities of the classes above named. This class of security offers a sound, conservative and advantageous form of investment for level-premium life insurance company funds to a much greater extent than has been generally recognized.

Safety of Securities

Obviously, a controlling factor for any investment of a life insurance company must be that of safety of principal. No matter how attractive an investment may be, the policy of demanding a high degree of safety as a prime requisite before any investment is made must be followed, and this factor of safety is unquestionably present to a high degree in the type of securities here suggested.

The electric companies are performing an essential public service and supplying a growing need and insistent demand. It is no exaggeration to say that the social life of the nation and its future business success are interwoven with its utility service and bound up with the future growth and development of the electric service. This fact supplies the foundation for a safe investment.

Gas service is the oldest public utility service of magnitude in this country. The telephone service, though that of a younger utility, has reached its highest stage of development in the United States. Both perform a utility service of such an essential character, and they are so intimately bound up



YEAR	TOTAL KWH GENERATED	GROSS REVENUE
1902	2 507 051 515	$ 78 735 500
1907	5 862 276 737	175 642 338
1912	11 569 109,885	302 273 398
1917	29 650 000 000	526 894 240
1918	34 826 410 000	664 850 000
1919	36 001 925 000	773 650 000
1920	40 288 264 000	932 000 000
1921	37 902 445 725	983 000 000
1922	44 084 575 000	1 084 000 000
1923	51 498 450 000	1 300 000 000

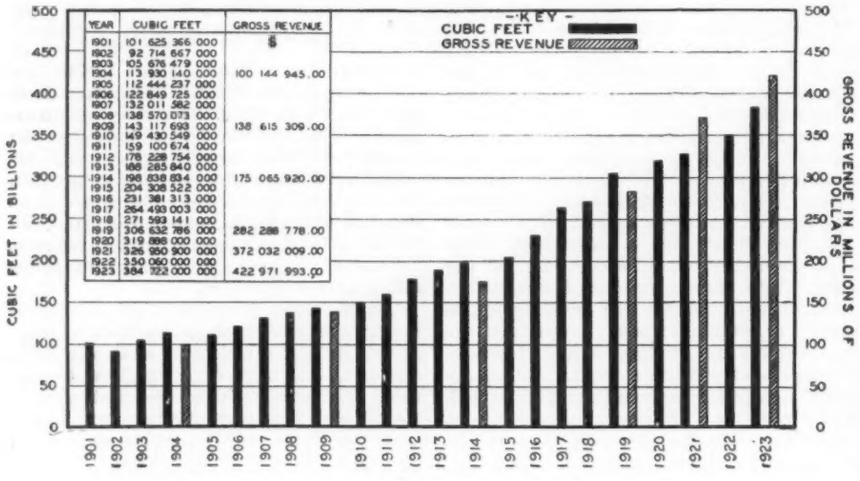
TOTAL KILOWATT-HOURS GENERATED AND GROSS REVENUE OF THE ELECTRIC LIGHT AND POWER INDUSTRY

with the social and industrial life of the nation that the continued soundness of these industries is beyond question.

The facts showing the continuous growth of electric and gas service and the gross revenue therefrom for more than twenty years are shown in the graphic charts here presented. The growth of service and revenue in the telephone business, although not shown, is equally impressive.

Capital Invested in Utilities

From an early date the securities of the steam railroads were a favorite form of investment, not only for insurance companies, but for trust funds generally. A large proportion of railroad capital has been obtained from these sources. The capital investment in other utilities is, however, nearly equal to that of the steam railroads.



YEAR	CUBIC FEET	GROSS REVENUE
1901	101 625 366 000	$
1902	92 714 667 000	
1903	105 676 479 000	
1904	113 930 140 000	100 144 945.00
1905	112 444 237 000	
1906	122 849 725 000	
1907	132 011 582 000	
1908	138 370 073 000	
1909	143 117 693 000	138 615 309.00
1910	149 430 549 000	
1911	159 100 674 000	
1912	178 228 754 000	
1913	186 285 840 000	
1914	198 838 834 000	175 065 920.00
1915	204 308 522 000	
1916	231 381 313 000	
1917	264 493 003 000	
1918	271 593 141 000	
1919	306 632 786 000	282 288 778.00
1920	319 886 000 000	
1921	326 950 900 000	372 032 009.00
1922	350 060 000 000	
1923	384 722 000 000	422 971 993.00

Annual Sales and Gross Revenue of the Gas Industry

The amount invested in the electric light and power utilities is approximately $6,600,000,000. The capital in the gas industry, in round figures, represents an investment of $4,000,000,000; that of the electric railways may be taken as about $5,800,000,000, and the investment in telephone utilities is about $3,000,000,000, a total of $19,400,000,000, as compared with the estimated railroad investment of $22,140,000,000.

The large aggregate of capital required for the gas, telephone and electric light utilities, which for the next ten years is estimated at an average of between one billion and one and one-half billion dollars per annum, demonstrates the public need for the service rendered and the growing demand for these services, the capital being required for the sound, progressive policy of supplying a permanent public demand for vital forms of service.

The electric industry has developed from its early period of functioning as a light-producing agency to the present period, where it functions in almost all activities of the industrial as well as the social life of the country, and it is evident that not only will the future capital needs of the electric light and power industry necessarily be very large but such capital will perform an economic service of the highest importance in the country's development.

All of these economic requirements present a highly favorable investment factor, of which life insurance companies and other trustees should avail themselves, and there are many evidences that they are alive to this situation, not only for the benefit of their policy holders but for the benefit of the country at large.

The history of the gas industry is one of expanding public uses. While originally established for lighting purposes only, for which purpose it is still used to a considerable extent, the main use of gas is found in other fields, and it is rapidly assuming a position of great importance in the industrial field. Electricity has taken over a large proportion of the lighting. This fact, however, has not prevented a steady growth in the use of gas. Such use will unquestionably call for expanding capital to meet the demands of the service.

Safety Factor of Value

The financing of these utilities is on a solid basis representing conservatism and foresight. This success is founded on service, progress and economies, and the investment has been singularly free from highly speculative considerations.

Financing has been done through the issuance of various classes of securities in accordance with enlightened policy. The results have not only been economic in themselves, but, generally speaking, there has resulted a financial structure capable of economic expansion to meet future requirements. The proportion of bonded debt in most companies of these classes has been kept conservatively low, and examination of the capitalization of the larger companies in the gas and electric group shows that for the group as a whole the proportion of bonded debt is well below 60 per cent of the capitalization. A large proportion of the present as well as past financing has been through the issuance of preferred and common stocks, maintaining a conservative proportion of bonds to other securities.

In determining the margin of safety assignable to mortgage bonds careful consideration must be given to the value of the equity represented by junior securities and the proportion of income available for such securities. It is believed that a very sound situation is presented in this respect by the mortgage bonds of electric and other utility companies. While authoritative valuation of the entire public utility property of the country is not available, the cost to reproduce the operating properties, as found in numerous cases before courts and commissions, is usually substantially in excess of the par value of the stocks and bonds outstanding on the property, so that the security of principal is generally greater than that indicated by the ratio of par value of bonded debt to total par value of securities outstanding. The mortgage bonds of well-located and properly maintained public utilities are thus in an unusually sound position as investments.

A study of the preferred stock dividend records of electric power and light companies yields very gratifying results. Of 122 companies each earning over $1,500,000 annually and having preferred stocks, each is now paying dividends on its preferred stock. Many have done so for a long series of years and many are also paying dividends on common stock. Sixty-seven of these pay dividends on their preferred stocks at the rate of 7 per cent per annum and most of the remainder at 6 per cent per annum. All but thirteen companies have paid dividends on their first preferred stock continuously from date of issue, and in the case of those companies arrears are now fully made up, with but a single exception. Of 125 of the principal electric, gas and telephone companies, 104 earn their fixed charges at least two times, and more than 50 per cent of the companies earn their fixed charges more than three times. The bonds and preferred stocks of most of these companies are widely distributed, and because of the incessant demands upon the companies for expansion of their facilities and the consequent need on their part for the acquisition of new capital they are under the strongest incentives to maintain this dividend record unimpaired. There has been a growing soundness in respect to the ability of these utilities to meet dividend requirements. Having successfully weathered the trials of the war and post-war periods, they may confidently be expected to satisfy all reasonable requirements from this time onward.

On the whole, the earnings of these utilities have been and are such as to assure the certainty of ability not only to meet interest charges but dividend requirements on stock issues. With few exceptions, the earnings available for interest are at least double the fixed charges on the funded debt.

Customer Ownership

It is not necessary to deal with customer ownership at length in this article. The conditions are well known within the industry and insurance companies and other investors are awake

to the tendency of the times. Customer ownership is providing a constantly widening opportunity for junior financing, solidifying and strengthening the credit of the company.

In the fourth annual report of the Federal Power Commission for the fiscal year ended June 30, 1924, the following statement is made: "This practice of local sales of securities not only has made the financing of many companies much simpler, but it has also brought about better relations between the companies and the public which they serve."

State Regulation

In all states except ten the electric and gas utilities are subject to regulation by state commissions, and it is probable that reasonable commission supervision will soon become effective in all or most of these remaining states. State regulation has become an accepted institution. Its principles and authority are upheld by the highest courts in the states and the nation as the soundest way of insuring the orderly, expert, impartial determination of the facts as to public utility properties, operations and costs; and while, on the one hand, such regulation insures the public against unreasonable or unjustly discriminatory rates or practices, on the other hand, it insures a reasonable return to the utilities and the practical certainty of the ability to meet interest charges. The right of the utility to rates yielding a fair return is generally recognized by the commission and is judicially fortified. If in a given instance a state commission errs on the facts or the law or undertakes to limit a utility to less than an adequate return, the courts are available for the speedy correction of such errors and the enforcement of the constitutional right of the utility to earn a fair return on the value of its property. These characteristics of state regulation and judicial review surround public utility investments with safeguards and certainties of prime importance. State regulation has been accepted and approved by the utilities, the associations representing the electric, gas and telephone industries, and by the investment bankers and the investors of the country. The practical absence of competitive service has greatly simplified problems of regulation for electric, gas and telephone utilities.

Public Relations

In the matter of public relations the utilities have long recognized the necessity of public confidence and good will. Their accounts are kept according to the uniform system of classification prescribed by the regulatory bodies. Public reports are submitted annually, or oftener, giving in detail financial and operating results, and every effort is being made to render the highest class of service and to establish and maintain public confidence.

Electric, gas and telephone utilities have practically eliminated the waste of duplication involved in competitive service. This is the most important factor to be considered in connection with determining the investment soundness of securities running over a considerable period of years. Most of the state regulatory acts frankly recognize the waste of duplication and competition and have put the stamp of disapproval upon them.

In conclusion, it may be said without fear of contradiction that the mortgage bonds of electric, gas, telephone and other public utilities have every qualification necessary to constitute them a source of sound investment for life insurance companies and other trust funds. The service rendered by these utilities is vital to modern civilization, and their stability has been demonstrated over a long period of years.

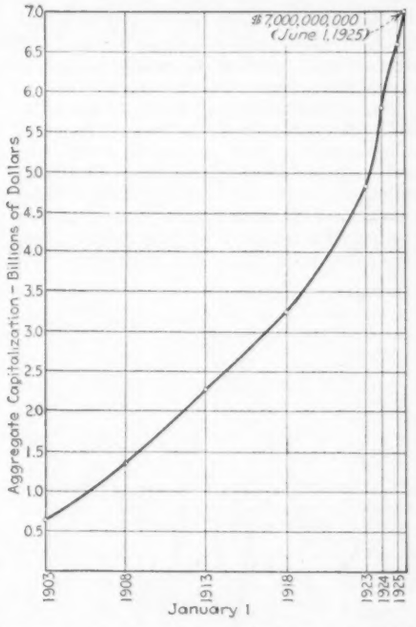
The law and practice under regulation have been established by the courts, and regulation is an element of soundness and safety. Utilities carry no large inventories and operate largely on a cash basis. No industry is any freer from labor troubles. The interest paid on such bonds is reasonably high, considering the element of safety. The securities are unsurpassed for prompt payment of dividends and they are readily marketable.

New uses for electricity and gas are being developed, providing increased market for added revenue. A large part of the securities are widely owned. The securities represent a minimum of risk, and every life insurance company can advantageously invest its new funds in this class of securities, applying, of course, the same conservative standards in the selection of the issues that have been maintained by the boards and officers of such companies in their past investments.

Development of Customer Ownership

Its Marvelous Growth Since the World War—Electric Light and Power Sales Direct to Customers in Past Five Years Total $622,000,000

ONE of the outstanding facts regarding industry today is the widespread interest taken by the general public in its financial side. Prior to the World War the owner of a government or corporation bond was looked upon as somewhat of a financier, a man of wealth and large affairs. But the war loans did much to change this trend of thought, and bond holding became a patriotic duty. The American people thus became interested in the investment of their surplus funds, and this interest has since the war shown an ever-increasing growth, until today one out of every seven persons of the country's population, one out of every four persons of voting age, one out of every three wage earners and one out of every two heads of families are the owners of stock in a corporation. With this newborn interest in the financial affairs of industry has come a deeper appreciation of the relations of the public and government to general business.



CENTRAL-STATION INVESTMENT HAS TRIPLED DURING THE LAST TEN YEARS

Exit Government Ownership

It was but natural that this trend toward popular ownership of securities should be most pronounced in the electric light and power industry, with which the public is brought into intimate contact every day in the week—an industry serving man with light, heat, power and transportation and one the prime function of which is service to mankind. Here is an industry the foundation of which has been carefully and scientifically planned and which has been built on the bedrock of public necessity and public good will. It was inevitable, therefore, that the small investor in his desire to invest his surplus funds properly should turn with full confidence to the electric light and power industry. Today there are more than seven million shares of stock alone owned by central-station customers and employees. The sales of stocks and bonds of electric light and power companies during 1924, both by investment houses and locally by the companies, totaled $1,175,120,800 for the country as a whole. During the first four months of 1925 a total of $538,625,000 in electric light and power securities has been sold through investment houses and direct to customers by the companies themselves, a figure equal to 32.4 per cent of all the financing of all types done in the country in this period. These sales of securities brought the aggregate capitalization of the electric light and power industry to approximately seven billion dollars on June 1, 1925.

The reason for the diminishing agitation for political operation of electric light and power systems, sometimes known as "municipal ownership," is to be found in this popular ownership of public utilities through their wide distribution among the citizens of the communities served. Here is a real popular ownership without the insidious influence of politics—a form of industrial operation which will not only humanize industry, but which will bring industry and those it serves into such close contact that each will understand the problems of the other, to the mutual good of both. Popular investment spells the death knell of political or municipal operation.

This drawing together of the electric light and power industry and the public has not been confined to any one section. The stockholders of the Edison Electric Illuminating Company of Boston now total 14,376; those of the Public Service Company of New Jersey increased from 250 in 1900 to 47,211 at the end of 1924, of the Commonwealth Edison Company from 1,255 in 1900 to 42,051 in 1924, of the Public Service Company of Northern Illinois from 2,753 in 1919 to 25,669, and the Southern California Edison Company increased its number of stockholders from 2,000 in 1917 to 70,103 in January, 1925. During 1924 it is estimated that approximately 300,000 customers and employees purchased electric light and power stock direct from the companies. The sales of stock to customers and employees in this way totaled $43,000,000 in 1920, $80,000,000 in 1921, $130,000,000 in 1922, $175,000,000 in 1923 and $194,000,000 in 1924. The 1924 figure, however, is based upon very incomplete data and is believed to be low, the actual total probably being around $240,000,000.

With this popular ownership has come, not less regulation, but saner and more flexible regulation by state regulatory bodies. In every state where customer ownership has developed rates, service and finances are under the jurisdiction of a commission which may be expected to protect the interests of both the public and the utilities. Such fair public utility regulation has increased the ability of the operating companies to meet their many problems and thereby to make interest returns to the security holders more certain. Secretary Herbert Hoover sums up the present favorable condition of the electric light and power industry as follows: "Our power investment has taken place largely since the public regulation of public utilities was established, and through that regulation, the better understanding of the investment banker and the greater skill of the engineer, there has been a more reliable return to the investor than from any other form of our national enterprise."

Electric Financing Totals $649,998,000

Central Stations of the Country Raise $501,448,000 During First Five Months of Year by Public Sales of Securities— Customer Sales Total $148,550,000

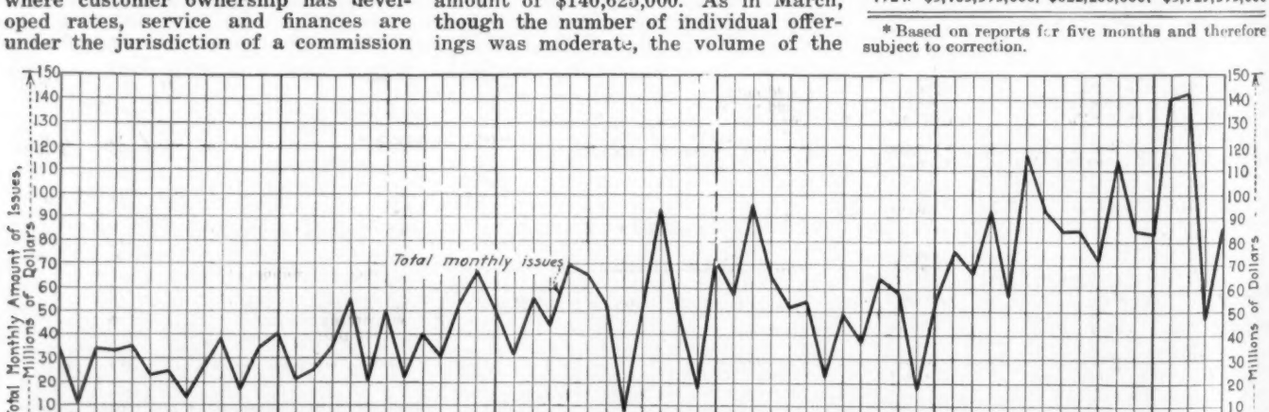
NEW capital issues floated in the United States through investment bankers by the electric light and power companies of the country during the first five months of the present year were of unusual magnitude, aggregating $501,448,000 and running considerably ahead of the totals recorded for similar periods in previous years. In 1924 new issues offered by the central stations from January through May amounted to $350,519,700, and in 1923 the utility companies raised only $342,580,150 during the corresponding period. These figures include bond, stock and note issues. March has been the banner month of 1925, contributing $143,942,000, the highest monthly total ever recorded by the industry. Only fifteen utilities participated in the month's financing, the volume of the offerings rather than the number being responsible for the huge total. It was during March that the Electric Power & Light Corporation was organized and offered four hundred thousand shares of cumulative preferred stock, a piece of financing involving a total of $40,000,000. Running true to form, January ushered in the new year with a substantial total—$83,400,000—and February followed with the exceptionally high amount of $140,625,000. As in March, though the number of individual offerings was moderate, the volume of the issues was large, two utilities contributing more than half of the month's total—the Consolidated Gas Company of New York with $50,000,000 and its subsidiary, the New York Edison Company, with $30,000,000 additional. During April and May there was a sharp decline in total securities issued— to $47,108,000 in the former month and $86,373,000 in the latter.

Out of a grand total of 104 issues floated in this five-month period fifty-seven have been in the form of mortgage bonds, twenty-nine in the form of preferred stocks, fourteen in the form of notes, and four have been in the form of common stocks. Attention is called to the prominent part played by the preferred stocks in the new light and power financing, a trend which is

SECURITY SALES, 1920-1924, INCLUSIVE

	Sales by Investment Houses	Sales Direct to Customers	Total
1920	$326,374,000	$43,000,000	$369,374,000
1921	458,917,000	80,000,000	538,917,000
1922	589,961,000	130,000,000	719,961,000
1923	747,722,000	175,000,000	922,722,000
1924	982,421,000	*194,200,000	1,176,621,000
Total 1920–1924	$3,105,395,000	$622,200,000	$3,727,595,000

* Based on reports for five months and therefore subject to correction.



SALES OF ELECTRIC LIGHT AND POWER SECURITIES THROUGH INVESTMENT HOUSES AND PER CENT YIELD, 1920 TO 1925

SECURITY SALES OF ELECTRIC LIGHT AND POWER COMPANIES
(Comparative Five-Month Statement)

	Sales by Investment Houses		Sales Direct to Customers		Total	
	1925	1924	1925	1924	1925	1924
January	$83,400,000	$57,594,000	$33,700,000	$25,000,000	$117,100,000	$82,594,000
February	140,625,000	76,184,700	29,750,000	27,000,000	170,375,000	103,184,700
March	143,942,000	67,025,000	45,100,000	26,000,000	189,042,000	93,025,000
April	47,108,000	92,950,000	15,000,000*	30,000,000	62,108,000	122,950,000
May	86,373,000	56,766,000	25,000,000*	23,000,000	111,373,000	79,766,000
Total five months	$501,448,000	$350,519,700	$148,550,000	$131,000,000	$649,998,000	$481,519,700

*Estimated.

indicative of the gradual appreciation by investors of the excellent dividend record of these stocks. Of course, customer ownership has accomplished wonders in the way of popularizing the preferred stocks of the central stations, and the above figures covering public sales through investment bankers also testify to the improved position of this type of security.

The tendency noted in 1924 to replace old issues bearing high interest rates by new issues yielding lower rates is again evident, and many companies have taken advantage of the easy money situation. The amount of new capital issues used for refunding purposes during the first five months of the year was approximately $127,707,600, or 25.4 per cent of the total, the balance representing new capital. In January out of a total of $83,400,000 approximately $30,622,000 was devoted to refunding and $52,778,000 represented new capital. In February $4,305,300 out of $140,625,000 was for refunding and $136,319,700 new capital. Approximately $61,912,300 out of the March total of $143,942,000 was devoted to refunding, the balance of $82,029,700 being new capital. In April $13,943,000 out of a total of $47,108,000 was for refunding and the remainder, amounting to $33,165,000, represented new capital, and in May $16,925,000 for refunding and $69,448,000 in new capital account for the total sum of $86,373,000.

The accompanying curve brings out in a striking manner the fact that companies have been able during the early months of the current year to borrow money at cheaper rates than during previous years. The average yield of the new security issues in January fell to 5.78 per cent from 6.15 in December. Another drop occurred in February, when the new light and power issues yielded the investor only 5.51 per cent. A marked upward trend was evident in March, the average return amounting to 6.20 per cent, but a sharp decline followed in April to 5.96 per cent. May's yield averaged 6.24 per cent.

General confidence in the stability of the industry, inspired largely by the splendid record of earnings for 1924 and a realization of the advantages derived from the recent merging of various power and light groups, has resulted in a conspicuous rise in stock values. An accompanying table indicates some of the advances which have occurred in leading utility stocks since last year.

YEAR'S ADVANCES IN ELECTRIC LIGHT AND POWER STOCKS

Stock	1924 High	1925 High
Adirondack Power & Light	37	85
Arkansas Light & Power	63	92
Brooklyn Edison	124¼	140⅜
Commonwealth Edison	136¼	141½
Consolidated Gas, Electric Light & Power of Baltimore	37½	44
Detroit Edison	115¾	125⅞
Edison Electric Illuminating of Boston	201	213
Montana Power	74¼	87½
Pacific Gas & Electric	105	118½
Philadelphia Electric	40⅜	47⅝
Public Service Co. of Northern Illinois	111½	116
Tennessee Electric Power	51	67
Virginia Railway & Power	72¾	123

Financing During Last Week of May Swells Month's Total

The last week of the month was responsible for the substantial sum of $86,373,000, a figure representing new offerings of electric light and power securities during the month of May. In the seven-day period ended May 29 seven new issues appeared, contributing $47,852,000 to the month's total. Twenty-three utilities participated in the month's financing, which netted the investor an average yield of 6.24 per cent. Though the financing was predominantly of a long-term nature, five short-term note issues were floated.

SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN MAY

Name of Company	Amount of Issue	Period, Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Milo Electric Light & Power Co. (Me.)	$200,000	20	First mortgage bonds		6	100	6
American Superpower Corp. (Del.)	3,325,000	...	First preferred stock	To acquire additional interests in certain electric light and power companies	6	95	6.30
					6	100	6
Androscoggin Electric Co. (Me.)	500,000	5	Gold coupon notes		6	88	6.80
Central Illinois Public Service Co.	616,000	...	Cumulative preferred stock				
Cities Service Co. (N. Y.)	10,000,000	40½	Refunding gold debenture bonds	Refunding	6	91	6.65
Indiana Power Co	1,000,000	3	Gold notes	To redeem gold notes, to reimburse for expenditures on additions and for other corporate purposes	5½	99	5.88
Northeastern Iowa Power Co.	200,000	1	Gold notes	Construction	5½	99½	5.75
Otter Tail Power Co. (Minn.)	350,000	5	Gold notes		6	101	5.75
Savannah Electric & Power Co.	1,200,000	20	First and refunding mortgage gold bonds, series B	To retire floating debt	6	98	6.15
National Electric Power Co.	1,500,000	...	Cumulative preferred stock		7	95	7.35
Utilities Power & Light Corp. (Va.)	4,000,000	...	Cumulative preferred stock	To reimburse for expenditures made in connection with additional investments in subsidiary companies	7	99	7.07
Community Power & Light Co. (Mo.)	1,750,000	25	First mortgage collateral sinking-fund gold bonds, series D	To finance acquisition of property and extensions	6	98	6.15
	750,000	...	Cumulative first preferred stock		7	95	7.40
Standard Gas & Electric Co. (N. Y.)	5,000,000	...	Cumulative prior preferred stock	To finance investment in public utility companies	7	100	7
Western Public Service Co.	4,200,000	25	First mortgage gold bonds, series A	To retire outstanding funded obligations and for other corporate purposes	6	98	6.15
Municipal Service Co. (Me.)	3,250,000	3½	Gold notes	To provide funds for purchase control of another utility	6	99½	6.15
Keokuk Electric Co. (Iowa)	700,000	20	First mortgage gold bonds, series A	Refunding and for other corporate purposes	6	98	6.15
National Public Service Corp.	4,500,000	30	Sinking-fund collateral-trust gold bonds, series A	To raise funds to purchase stock of another utility and for other corporate purposes	6½	97½	6.70
Southern Pennsylvania Power Co.	1,200,000	30	First mortgage and collateral trust bonds, series A	Construction and improvements	6	98	6.15
Louisville Gas & Elec. Co. (Ky.)	11,700,000	...	Common stock, class A		..	26	....
Minnesota Power & Light Co.	3,500,000	30	First and refunding mortgage gold bonds	To reimburse for additions and for other corporate purposes	5	97	5.20
Associated Gas & Electric Co.	14,000,000	30	Secured gold bonds	To reimburse for expenditures made for acquisitions, improvements and additions	6	95½	6.34
Los Angeles Gas & Electric Corp.	2,952,000	24	General and refunding mortgage gold bonds, series I	Additions	5½	100	5.50
Pacific Gas & Electric Co.	10,000,000	30	First and refunding mortgage gold bonds, series D	Additions and improvements	5	95½	5.30
Total	$86,373,000						

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stocks is $100.)

Companies	Bid Price Friday, May 29	Low 1925	High 1925
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	105	98	106
Appalachian Power, 7 per cent	97½	92	100
Arkansas Light & Power 7 per cent	96	92	98
Asheville Power & Light 7 per cent	a 99	99	100
Central Illinois Public Service 6 per cent	92	84	93
Colorado Power 7 per cent	94	93	98
Connecticut Light & Power 7 per cent	106	105	110
Consumers' Power 6 per cent	92	90	93½
Dayton Power & Light 6 per cent	94	88	100
Duquesne Light 7 per cent	a110½	105	110½
Eastern Texas Electric 6 per cent	100	100	105
Empire District Electric 6 per cent	78	78	85
Fort Worth Power & Light 7 per cent	a101	101	102
Great Western Power 7 per cent	101		
Illinois Northern Utilities 6 per cent	88	82	92
Illinois Power & Light 7 per cent	95	92½	98
Kansas Gas & Electric 7 per cent	a100	99¾	100
Long Island Lighting 7 per cent	102	100	105
Minnesota Power & Light 7 per cent	c 98½	98½	100
Mississippi River Power 6 per cent	90	87½	92
Nebraska Power 7 per cent	a100	100	101
Niagara Falls Power 7 per cent—25	28½	28	29
Niagara, Lockport & Ont. Power 7 per cent	109	101½	110
Northern States Power 7 per cent	96	95	100
Ohio Public Service 7 per cent	97½	97	100
Pacific Gas & Electric 6 per cent	95	92	97
Pacific Power & Light 7 per cent	a 99	99	100
Penn-Ohio Power & Light 7 per cent	94	91	100
Pennsylvania Power & Light $7—no par	a103	103	104
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	38	37½	45
Southern California Edison 8 per cent	120	115	122
Southern California Edison 7 per cent	106	105	107½
Southern Calnfornia Edison 6 per cent	92½	90	92½
Tennessee Electric Power, 6 per cent	83	80	84
Texas Power & Light 7 per cent	a100½	100	102
Utah Power & Light 7 per cent	a 99¾	99¾	101
Western States Gas & Electric 7 per cent	89	82	89
Yadkin River Power, 7 per cent	a 99½	99½	101
Holding Companies			
American Gas & Electric 6 per cent—no par	89	85	90
American Light & Traction	98½	93	100
American Power & Light 6 per cent	88½	84	90
American Public Service 7 per cent	91	88	94
American Public Utilities 7 per cent	89	87	95
American Water Works & Electric 7 per cent	a101	100	103
Associated Gas & Electric 7 per cent—1 per cent extra—50	a 52		
Associated Gas & Electric—$6—no par	84		
Carolina Power & Light 7 per cent	103½	100	105
Central Indiana Power 7 per cent	89	88	95
Cities Service 6 per cent	81	80	83
Commonwealth Power 6 per cent	83	80	85½
Continental Gas & Electric 7 per cent pr. pf.	91	89	95
Electric Bond & Share 6 per cent	a103	103	104
General Gas & Electric—$8—no par	112	104½	114
*Middle West Utilities 7 per cent	96	91½	98½
National Power & Light—$7—no par	99	95	99
North American 6 per cent—50	a 50¼	46½	50½
Public Service Corp. of N. J. 7 per cent	101½	99	102
Public Service Corp. of N. J. 8 per cent	114¼	108¼	114¼
Standard Gas & Electric 8 per cent—50	53		
†United Gas Improvement—50	57½	56½	58½
United Light & Power—$6.50—no par	85	83	89
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	80	31	85
Appalachian Power—no par	77½	70	83
Arkansas Light & Power	95	65	95
Brooklyn Edison	a135	120½	140½
Buffalo General Electric—no par (new)	66	44	69
*Commonwealth Edison	141½	130½	141½
§Consolidated Gas, Electric Light & Power	42	32	44
Dayton Power & Light	420	180	460
Detroit Edison	a124	110	125¾
|| Edison Electric Illuminating of Boston	211½	200	213
*Kentucky Hydro-Electric	92½	85½	92½
Long Island Lighting (new)	80	60	85
Mississippi River Power	48	37	48
Montana Power	a 84½	64	87½
Niagara Falls Power—no par	68	45½	69
Niagara, Lockport & Ontario Power—no par	65	60	73
Northern Ohio Power	11	5	13½
Northern States Power	114	103	118
North Texas Electric	40	40	70
Pacific Gas & Electric	a113	102½	113
‡Penn Central Light & Power—no par	68	60	68
§Pennsylvania Water & Power	138	126½	144½
‡Philadelphia Electric—25	38¾	37¾	47¾
Public Service Co. of Northern Illinois	114	97	116
Puget Sound Power & Light	57	49	61
Southern California Edison	107½	102	107½
Tennessee Electric Power—no par	65	47	67
Virginia Power	65	65	92
Virginia Railway & Power	a121½	64½	121½
West Penn. Co.	142	105	145
Holding Companies			
American Gas & Electric—no par	81	70	85
American Light & Traction	167	139	172
American Power & Light	60	52	67
American Public Utilities	78	70	85
American Water Works & Electric	a 68	34¾	68
Associated Gas & Electric, Class A	a 33¾		
Carolina Power & Light—no par	400	290	425
Cities Service (new)	37	34	43
Columbia Gas & Electric—no par	a 65½	45¾	69½
Commonwealth Power Corp.—no par	160	106	168
Consolidated Gas—no par	a 86½	74¼	89½
Continental Gas & Electric	84	77	90
Electric Bond & Share Securities	a 74	74	76½
Electric Power & Light	a 34½	17¾	37
Federal Light and Traction	a 32	30	33½
General Gas & Electric	95	72	102
Lehigh Power Securities—no par	126	82	131
*Middle West Utilities—no par	93	82½	102½
National Power & Light—no par	320	185	325
North American—10	a 49¾	41½	50½
Philadelphia Co.—50	a 56½	51½	59½
Power Securities—no par	18		
Public Service Corp. of N. J.—no par	a 72	62½	74
Standard Gas & Electric—no par	a 53¾	40¾	54½
United Gas & Electric (Conn.)—no par	42	26	45

Companies			Bid Price Friday, May 29	Low 1925	High 1925
BONDS					
Operating Companies					
Adirondack Power & Light	6s	1950	105½	102¼	105½
Alabama Power	5s	1946	99½	96	100
Appalachian Power	5s	1941	98½	96	99½
Brooklyn Edison	5s	1949	102	99½	103
	6s	1930	105½	104	105½
Cleveland Electric Illuminating	5s	1939	101	100	102
Commonwealth Edison	5s	1943	101½	99½	102
	5s	1953	100	98½	101
§Consol. Gas, Elec. Lt. & Pwr.	4½s	1935	95½	93½	97½
	5½s	1952	104½	102½	104½
Consumers' Power	5s	1936	100	99	100½
	5s	1952	99½	90½	100
Detroit Edison	5s	1933	101½	99½	102½
Duquesne Light	6s	1949	106	104¼	107½
Great Western Power	5s	1946	98½	9-	99
Kansas City Power & Light	5s	1952	100½	95½	100½
Mississippi River Power	5s	1951	99	96½	100
Montana Power	5s	1943	100	97½	100½
New England Power	5s	1951	101½	100½	102
New York Edison	6½s	1941	114½	112	115½
Niagara Falls Power	6s	1932	106	103½	106
Northern States Power	5s	1941	98½	93	99½
	6s	1941	105½	103	107½
Ohio Power	7s	1951	106½	106½	107½
Pacific Gas & Electric	5s	1942	98½	93½	98½
Pennsylvania Water & Power	5s	1940	100½	99½	102
‡Philadelphia Electric	5s	1966	103½	100½	103½
	5½s	1947	106½	103½	106½
	6s	1941	107½	106	107½
Portland Electric Power	6s	1947	98½	96½	100
Southern California Edison	5s	1939	100	99½	101
	6s	1944	104	102½	104½
Tennessee Electric Power	6s	1947	104	99½	104½
Texas Power & Light	5s	1937	98½	97	99½
Toledo Edison	7s	1941	109½	108½	110
Utah Power & Light	5s	1944	98½	91	98½
Holding Companies					
Alabama Traction, Light & Power	5s	1962	94	86	95
American Gas & Electric	6s	2014	98½	96½	98½
American Power & Light	6s	2016	97½	94	98
Amer. Water Works & Electric	5s	1934	97½	92½	98
Associated Gas & Electric	6½s	1954	a101		
Central Indiana Power	6s	1947	98	95½	98½
Commonwealth Power	6s	1947	102	97½	102½
Consolidated Cities Lt., Pwr. & Tr.	5s	1962	81½	75½	82
Illinois Power & Light	6s	1953	102	100½	102½
United Light & Railways	5s	1932	97	93½	97
	6s	1952	100	95¾	100½

ELECTRICAL MANUFACTURING COMPANIES					
PREFERRED STOCKS					
Allis-Chalmers Manufacturing			106	103½	107½
Worthington Pump & Machinery A			a 82	79	88
COMMON STOCKS					
Allis-Chalmers Manufacturing			a 84¾	71½	86½
American Bosch Magneto—no par			a 34½	26½	54½
Electric Storage Battery—no par			65½	60½	70½
General Electric			a293½	227½	320
General Electric—10			a 11½	11	11½
*Hurley Machine—no par			51½	41½	56
†Wagner Electric			39	26½	50
Westinghouse Electric & Manufacturing—50			a 73	66½	84
Worthington Pump & Machinery			a 42	36½	79½
BONDS					
General Electric	3½s	1942	83½	83	84
	5s	1952	105½	101½	105½
Robbins & Myers	7s	1952	64	64	73½
Western Electric	5s	1944	100½	98	101
Westinghouse Electric & Mfg.	7s	1931	106½	106½	108½

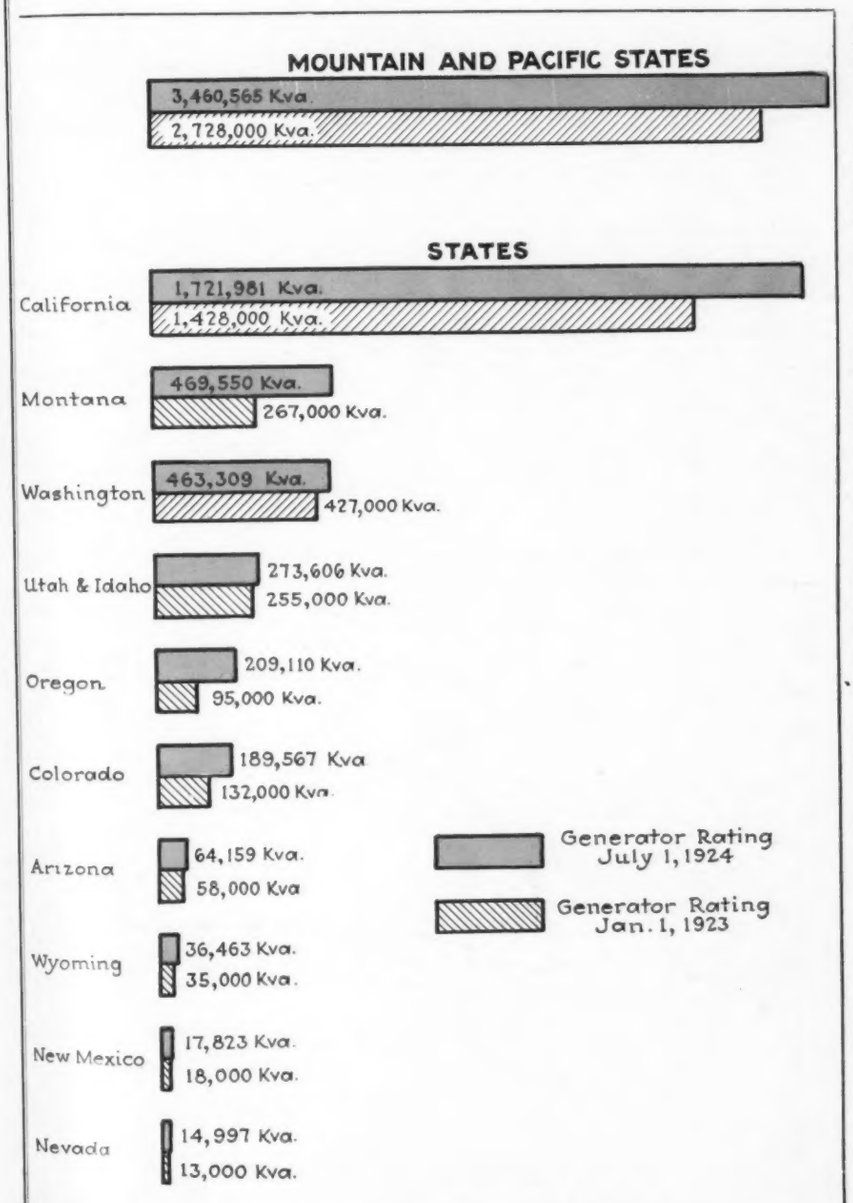
*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡ Philadelphia Stock Exchange. || Boston Stock Exchange §Baltimore Stock Exchange.
a Bid price, low and high, Tuesday, June 2.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

"Eureka!"

THE spirit of the West is well exemplified in the exclamation "Eureka!" ("I have found it!"), which, according to tradition, was first uttered by the Greek philosopher Archimedes upon discovering a method of determining the purity of the gold in King Hiero's crown. In fact, this exultant expression is the official motto of the State of California, the commonwealth which is generally accepted as typifying most clearly what is meant by "the West."



But the members of the electric light and power industry who have the good fortune to journey westward during June to attend the convention in San Francisco will find that the West has not confined the sentiment of "Eureka!" to the discovery of gold, but that the term also pictures the application of electrical energy to meet the needs of the homes, farms, mines and factories of that great section of the country.

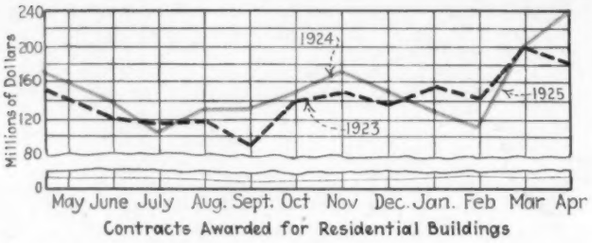
Nature has been good to the Mountain and Pacific States in providing an automatic source of energy in the form of water power. This source has been harnessed, and the electrical energy produced thereby is transmitted across mountains and over plains and valleys by the longest and most highly energized lines in the world. Today finds this section of the nation leading in the electrical "saturation" of the home, farm, mine and factory. Some territories are very close to 100 per cent saturated, and it is a frontier point indeed which does not have at its beck and call this great force of nature. The "open spaces" have been drawn together into one cohesive whole through the combining influence of electrical energy.

The electric light and power industry of the West is pushing on to greater and greater service, not content until the possibilities of every potential user of electrical energy have been fully developed. During the eighteen-month period from January 1, 1923, to July 1, 1924, the generator rating of the section was increased by 732,565 kva., or more than 27 per cent. Well may the industry of the West be proud of its record, and well may the public it serves, as it views the transformation of falling water into light, heat and power, lift high its voice in the enthusiastic cry of "Eureka!"

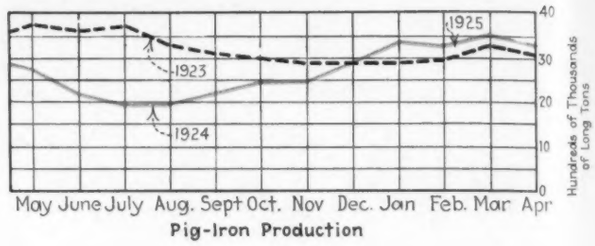
Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote or use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

How the Primary Industries Are Trending

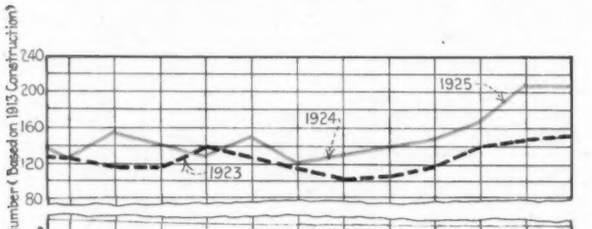
All data except that on "Volume of Construction" and "Construction Cost" are supplied monthly by the Bureau of the Census. Similar data on other industries may be obtained from the "Survey of Current Business," Bureau of the Census, Washington, D. C.



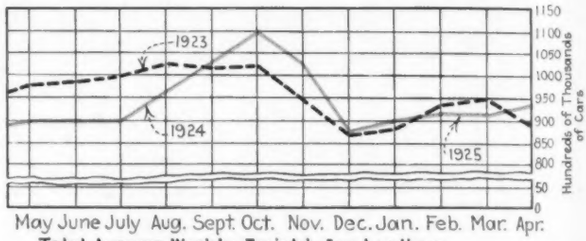
Contracts Awarded for Residential Buildings



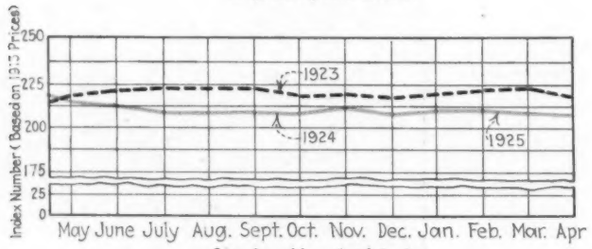
Pig-Iron Production



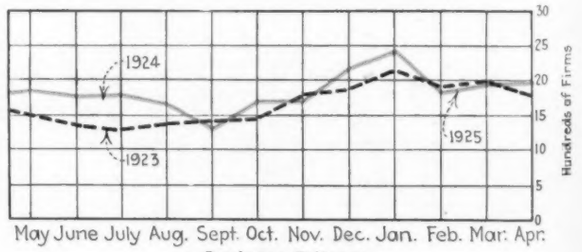
Construction
(Engineering-News Record)



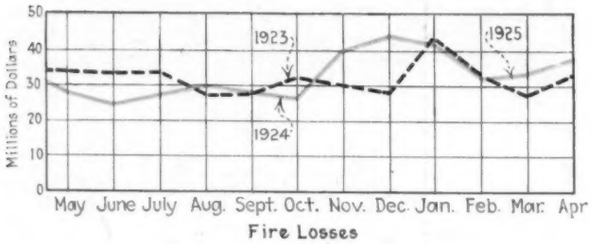
Total Average Weekly Freight-Car Loadings



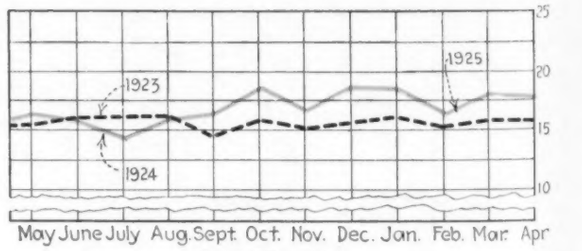
Construction Cost Index
(Engineering-News Record)



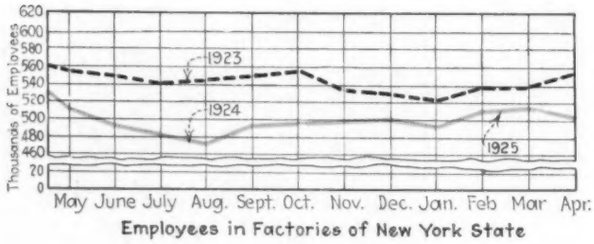
Business Failures



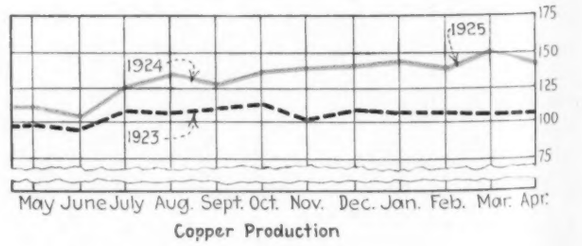
Fire Losses



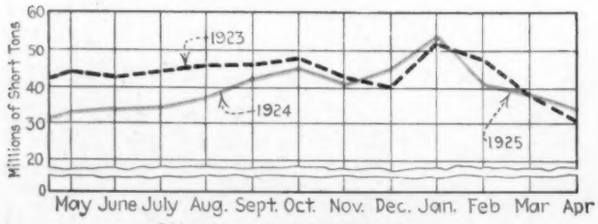
Bank Clearings
(Outside of New York City)



Employees in Factories of New York State



Copper Production



Bituminous Coal Production

April Activity on March Level

PRODUCTION in basic industries and factory employment during April was about on a par with March. Building contracts awarded during April were the largest on record, both in value and in square feet. Freight-car loadings were greater than in March and larger than in any previous April.